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Instructions to Binder.

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ERRATA.

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Page 850, line 23 from the top for *Francolinus francolinus interposetus* read *Francolinus pondicerianus interposetus.*

„ 850, „ 28 from the top for *Francolinus francolinus mecranensis* read *Francolinus pondicerianus mecranensis.*

„ 864, footnote *for* Matthews' *read* Matheus.

„ 871, line 20 from the top for *Malanogaster* read *Melanogaster.*

„ 895, „ 9 from the bottom *for* badly *read* hardly.

„ 931, „ 20 from the top for *austaliensis* read *australiensis.*

„ 982, „ 13 from the top for *Macropigia* read *Macropygia.*

„ 983, „ 11 from the top for *challybeus* read *chalybeus.*

„ 985, „ 25 from the top for *Numeneus* read *Numenius.*

„ 985, „ 29 from the top for *Numeneus* read *Numenius.*

„ 1030, „ 3 from bottom *for* (*a*) *read* (*e*).

„ 1034, „ 5 from bottom for *antannæ* read *antennæ.*

„ 1119, „ 4 from the top for *Alavdidæ* read *Alaudidæ.*

„ 1119, „ 11 from the top for *Pericrocutus* read *Pericrocotus.*

„ 1119, „ 11 from the top for *perejurius* read *peregrinus.*

„ 1119, „ 17 from the top for *Alavdidæ* read *Alaudidæ.*

„ 1135, „ 20 from the top for *brachyara* read *brachyura.*

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THE

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($\frac{2}{5}$ natural size)

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DECEMBER 1921. VOL. XXVIII. No. 1.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART XXX—*(contd.)*

(Continued from page 664 of Volume XXVII)

(With a plate).

Genus—ARBORICOLA.

ARBORICOLA RUFOGULARIS INTERMEDIA.

The Arrakan Red-throated Hill Partridge.

Arboricola intermedia—Blyth, J. A. S. B., xxiv, p. 277, (1856), (Arrakan); id., Ibis, 1867, p. 159, (Arrakan); Blyth and Wald., Cat., Mam. and B. of B., p. 150, (1875), (Arrakan); Hume and Marsh. Game-B., ii, p. 85, (1879); Hume, S. F., viii, p. 111, (1879); Oates, B. of B. B., ii, p. 327, (1883); Hume, S. F., xi, p. 307, (1888), (E. Manipur); Oates, Hume's N. and E., iii, p. 440, (1890); Ogilvie-Grant, Ibis, 1892, p. 393; id., Cat. B. M., xxii, p. 211, (1895); id. Hand-L. Game-B., i, p. 165, (1895); Oates, Man. Game-B., i, p. 140, (1895); Blanf. Avifauna, B. I., iv, p. 127, (1898); Stuart Baker, J. B. N. H. S., xii, p. 491, (1899), (N. Cachar); Oates, Cat. Eggs, B. M., i, p. 43, (1901); Harington, J. B. N. H. S., xix, p. 310, (1909), (Bhamo); Hopwood, ibid., xxi, p. 1215, (1912), (Arrakan); Hopwood and Mackenzie, ibid., xxv, p. 91, (1917); (N. Chin Hills).

Arborophila intermedia—Hume, S. F., ii, p. 450, (1874), (Arrakan); Oates, ibid, iii, p. 344, (1875), (Arrakan).

Vernacular Names.—Toung-Kha, (Burmese); *Wo-gam* or *Gam-toung*, (Kachin); *Daobui* or *Daobui-y'gashi*, (Cachari), *Inrui-whip*, (Kacha Naga).

Description—Adult Male.—Similar to *rufogularis*, but with spots on chin and throat so close together as to make these parts appear uniform black, whilst the black bar below the rufous is absent.

The abdomen is generally a paler slate, and the spots on the crown are often blacker and larger.

Colours of Soft Parts.—Irides brown ; orbital skin, gular skin and gapered ; bill black ; legs red, claws paler and horny. In the breeding season *all* the colours of the soft parts become more intensely and vividly coloured. The red of the throat and gape is a brilliant red, showing distinctly through the feathers, and the legs become a bright coral-red as against a salmon or brick-red in the cold weather.

Measurements.—Wing from 138 to 148 mm., the average of 28 males, including those in the British Museum, being 145·5 mm. ; tarsus 37·5 (a very short-legged bird) to 42 mm., averaging about 41 mm. ; bill from front about 18 or 19 mm. ; tail 52 to 60 mm.

Adult Female.—Is very like that of *rufogularis*, but has no black band below the chestnut neck, and the chin may be rather more profusely spotted with black. It does not, however, seem ever to become uniform black as in the male.

Colours of Soft Parts.—As in the male, but paler and duller. Legs more yellow.

Measurements.—The female appears to be decidedly smaller than the male, the wing measurements vary between 134 and 143 mm., and the average is only 138 mm.

Young in First Plumage.—Throat dull pale rufous-brown with only faint signs of spotting above, like the adult, but duller ; the crown is vermiculated rather than spotted with black. The sides are vermiculated with brown and black, and the centre of breast and abdomen are paler and whitish.

The Young when practically Adult are profusely spotted with white all over the breast, abdomen and flanks ; otherwise they are like the adult with the throat and chin duller rufous and the legs, orbital and gular skin dull yellowish.

Nestling.—Rather bright chestnut brown above, dingy white below ; supercilium and cheeks paler, a dark brown line behind the eye dividing into two.

Distribution.—The Arrakan Red-throated Hill Partridge is found throughout Assam East and South of the Brahmapootra, through Manipur, Looshai, Chittagong Hill Tracts, Arrakan, Chin and Kachin Hills. Nisbett found it very common round about Sadon, and met with it again at Thandoung ; Harington obtained it round about Bhamo, and Hopwood, Mackenzie, Wickham, and many others have obtained it practically all over the Chin and Kachin Hills, well to the South, and it almost certainly occurs in the Northern Shan States, but is replaced in the Southern Shan States, Siam and Karen-nee by the next race, *tickelli*.

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Nidification.—This form of *rufogularis* breeds freely in the Assam Hills and in Manipur, Chittagong, etc., at all heights between 1,500 feet and 6,000 feet, and in the Chin and Kachin Hills apparently still higher than this, as it was obtained on Mount Victoria at about 9,000 feet during the breeding season. Probably its favourite elevation is between 3,000 and 6,000 feet, and most of the nests taken by myself both in North Cachar and the Khasia Hills were between 4,000 and 6,000 feet.

The breeding season commences in the first fortnight in April, and continues until the end of May, but I have also found eggs throughout the months of June and July and in the first two weeks of August. It is, however, quite possible that many birds have two broods, and two such instances at least have come within my own experience.

It does not seem to be at all particular as to what kind of country it makes its nest in so long as there is sufficient cover, and even this need not be so very dense. I have personally taken nests from dense evergreen forest with the most luxurious undergrowth, and from thin bamboo jungle with only a little grass growing in the more open patches between the clumps of bamboo. It was common in the beautiful Pine forests of the Khasia Hills, and it equally often made its nest in the rhododendron and oak forest on the rocky sides of its hills and peaks. I also took its nest on more than one occasion in the deciduous oak forests in the N. of N. Cachar. Here the trees grew far apart like those in a glorified English Park, and their black stems grew straight and sombre against a vivid ground of brilliant green grass. For the most part the plateau consisted of gently undulating hills and slopes, but in some places it was broken up into rocky ravines and water courses in which bushes were more plentiful, and in these the Hill Partridges bred, often making their nest in some hollow under the shelter of a stone or protecting buttress of rock.

The nests themselves varied very greatly in character. The first I ever found was a mere hollow scraped out under a projecting stone on a steep hill side. Here and there grew scattered trees and bushes, but the grass which had been burnt off some couple of months previously was only a few inches high, and still sparse and thin. I was coming home after a long day's gaur shooting and sliding down the steep hill to the ravine at the bottom, practically kicked the bird off her nest in the dusk. An equally exposed position was that of a nest containing four eggs placed in a bed of fallen bamboo leaves in thin bamboo jungle with no undergrowth. In neither of these cases was there any nest at all beyond the fallen debris lying on the ground beneath the eggs. At the other extreme in description are the cleverly hidden and well-made nests which one sometimes finds in grass. I have seen nests composed of really well interlaced grass matted down into a fine compact cup, whilst the surrounding grass was so arranged that as it grew it formed a complete back, sides and roof to the nest,

whilst in front it was brought down and across the entrance so as to make a regular little tunnel to the nest, sometimes nearly a foot in length. How the growing grass was made to serve its purpose I could never quite make out, as it did not appear to be interwoven so much as matted down until it fitted into position, it really looked as if one bird had stood below to fashion the tunnel, whilst the other had beaten the grass down above its companion. I only noticed nests of this kind when they were made in growing grass, and I never saw a domed nest made when the material had to be brought to the nest for the purpose of making the sides and roof.

The hen bird sits very close, and the Nagas always assured me that they could make sure of catching her on the nest once they had found it, certainly they generally brought me in the hen bird with her eggs whenever these were brought in for me. I do not think the cock bird assists in the incubation, but he may do so at night, as do so many other cock birds amongst the Pigeons, etc. When his wife is sitting, he is generally to be found somewhere round about in the immediate vicinity, and I think these birds pair for life, as the same pair may be seen year after year breeding in the same locality, if they are not disturbed. A pair bred thus in a ravine quite close to my house at Gunjong in N. Cachar. The first year the Nagas took the eggs, but after I had forbidden this and let the hen bird loose when she was brought to me, the partridges continued to breed for three more years in the same spot, one year rearing two broods of four, all ten birds being found together constantly throughout the following winter.

The eggs of this bird are just like those of *A. r. rufogularis*, pure white, rather glossy, and generally broad ovals, pyriform in shape, but not peg top. The smaller ends are nearly always very pointed, and sometimes rather compressed. Narrower oval eggs are not uncommon, and exceptionally broad ones about equal numerically.

The average of 100 eggs is 37·4 by 28·0 mm.

The longest and broadest measures 43·0 by 32·0 mm., and the shortest and most narrow 33·4 by 26·6 mm.; in both cases the two greatest and least measurements being obtained in the same individual egg.

The number of eggs in a clutch is undoubtedly most often 4, sometimes 5, and very rarely more. It is possible that on the rare occasions on which 7 and 8 have been taken they are the production of two hens with one husband. I have frequently seen 3 eggs incubated, though these have generally been taken very late or very early in the season.

General Habits.—This very pretty little Partridge may be found in practically any kind of cover, whether evergreen forest, deciduous Oak, etc., Pine forest with but little undergrowth, dense secondary growth or any kind of Bamboo jungle. It does not venture much into the open, except early in the mornings and evenings for feeding, but at these times it may often be found at the edges of cultivation clearings, more especially in long rice, cotton or mustard crops. It

wanders slowly about in small coveys, generally 5 or 6 in number, sometimes a dozen or so, in the latter instances the parties being formed either of two separate families or of two broods. As a rule the individuals will be found close together, but often they string out a good deal, and when this is the case they keep in touch with one another by means of a soft low whistle constantly uttered as they move along. They also indulge in a crooning chuckle which they give vent to as they move about, turning over the leaves in their search for insects, seeds, etc., and scratching in all the fallen rubbish for odd scraps of food. I have often sat in the open forest and watched them feeding, and have been much impressed with their habit of conducting a sort of follow my leader game. First one bird will saunter casually along, scratching here and picking there, and then giving a quick little run to another attractive spot; the next bird comes along and carries out almost exactly the same programme, and then another and another, until they have all passed out of sight, and one hears their low whistle gradually fade away in the distance, as they call to one another to "come on." The illustration gives a capital idea of how these little birds come out to drink in a more or less open place. With most coveys of game-birds when one of their number has taken the plunge and decided it is safe to face the open, the rest at once follow suit without further precautions, but with the Hill Partridges each individual has to satisfy himself that all is safe before he follows in the stept of those ahead of him.

During the breeding season they split up into pairs, and the old birds drive off their last brood to fend for themselves. The call, I think there is no difference between that of male and female, is a loud double whistle, very clear and musical, and one which can be heard at a great distance. They are not fighters, as far as I am aware, but one hears their call ringing out morning and evening, all over the forests where these birds are plentiful, one bird answering another until the sun gets high in the mornings or the darkness begins to close down in the evenings. I have already syllablized this whistle as "Wheea-whu" the first note rather prolonged, the second short and sharp.

Although a partridge, one can really hardly consider this a gamebird from the sportsman's point of view, for I know of no place where they are sufficiently plentiful to ensure a day's sport. They fly well and fast, and are extraordinarily clever in getting through bamboo and tree forest without mishap, and to kill them in cover it takes a rare good shot to bowl them over with any certainty, for they twist, dodge and turn in every direction at full speed. When out Jungle-fowl shooting in N. Cachar, one or two of these birds generally formed a portion of the bag, but the number never exceeded a dozen, and was seldom half that number.

They roost either on trees or on bamboos, and I have frequently disturbed them from such places during the heat of the day. When

roosting, the whole covey generally snuggle close in to one another on the same perch like a family of Munias or Love-birds, and the pot hunter might well be able to wipe out the whole covey at one shot did he ever get the chance, but, as a matter of fact, often as I have disturbed them from trees, it is but seldom I have seen them before they saw or heard me and flew off. On the rare occasions I have seen them I have generally been on the track of big game, and have been sneaking along as silently as possible.

They eat grain and insect food indiscriminately, and also buds and leaves of many kinds. I have killed them with their crops full of paddy, bajra (a kind of millet), mustard shoots and leaves, and often with beetles, grubs, larvæ and ants, of which latter they seem to be especially fond. White ants or termites, they, of course, in common with almost every bird, are very greedy over, not only seizing them as they run about or fall to the ground, but also as they fly from the ground, hopping high into the air after them and sometimes fluttering a few feet in pursuit of them.

The Nagas and other Hill Tribes catch these Hill Partridges in exactly the same manner as that described by Col. Godwin-Austen, and they also take numbers in single spring nooses set with a single termite as bait. In these latter traps the birds are nearly always killed, for the bamboo springs are very strong, and as the birds are invariably caught by the neck, the jerk back generally dislocates this.

They form an excellent table dish, rather dry, but very sweet and very tender unless extra old.

They are easy to tame and keep in captivity, and not quarrelsome either with other birds or with those of their own genus, but they must have ample room, some cover and a diet with a liberal amount of animal food, and if insects are unobtainable, a small amount of chopped liver seems to suit them admirably.

Arboricola rufogularis tickelli.

Tickell's Red-throated Hill Partridge.

Arboricola tickelli—Hume, S. F. Game-B., ii, p. 77 and footnote, p. 78, (1880), (Mooleyit, Tennasserim).

Arboricola rufogularis—Ogilvie-Grant, Cat. B. M., xxii, p. 212, (1893), (part) ; Blanf., Avifauna, B. I., iv, p. 126, (1898), (part).

Arboricola rufogularis—Hume and Davis, S. F., vi, p. 414, (1878), (Muleyit) ; Barnby Smith, Avicul. Mag., iii, 10, p. 294, (Aug. 1911).

Vernacular Names.—Toung-kha, (*Burmese*).

Description—Adult Male and Female.—Similar to *rufogularis*, but with no black band below the rufous of the throat and neck. The white of the cheeks and cheek-stripe is perhaps more conspicuously white, and the lower parts are decidedly paler, and with far more white on the abdomen. I cannot find any distinguishing character between the male and the female in colour.

Colours of Soft Parts.—" The legs and feet appear to be always much paler " (than the Himalayan race) " a pinky and not a bright red. " (Hume).

Measurements.—Males, wings 138 to 148 mm., average 145 mm., females 132 to 136 mm., average 134 mm. There are only small series of either sex in the British Museum, so that the averages mean but little.

From the measurements available, however, it seems that Hume was right in saying that the Tennasserim race is bigger than the Himalayan one.

Distribution.—Tennasserim, South Shan States and probably Eastern and Southern Siam and the Northern Malay Peninsula. A specimen in the British Museum collection from the Southern Shan States is quite typically of this race.

Nidification.—There is no account of this bird breeding in a wild state, but Mr. Barnby Smith has given us a very interesting account of its nesting in captivity. He says :—

" I moved the partridges into a small run to themselves, the ground being covered with old tussocks of grass and a small shelter shed with sanded floor being provided at one end of the run, also several branches for perches outside. I gave the birds for nesting purposes a lot of dried grass both outside and inside the shed.

" About 10th March nearly all the dried grass inside the shed was moved from one corner to another and formed into a covered nest, the bottom of the nest being a hollow scooped out in the sand. Apparently this nest was not pleasing to the birds, and they were soon seen busy pulling about the dried grass I had provided outside the shed.

" By the 18th March they had completed a second nest—a curious domed structure. The back of the nest was a large tuft of grass, the nest itself being a rather deep, large hollow in the ground lined with grass and covered all over (except the entrance hole in the side opposite the tuft) with a large mass of dried grass. . . It was interesting to note how careful the birds were during the nesting period to put dried grass from time to time so as nearly to block up the entrance at the side of the nest when not in use. The result of this was excellent, as when one of the birds had just emerged from the nest the round hole would strike the eye, but, when partly blocked with grass, the nest was practically invisible.

" Both birds continued to sit like stones for some time, and when I finally disturbed the nest I found four eggs in it.

" These eggs were white and measured 1·6 by 1·2 inches."

Unfortunately both birds proved to be females, so nothing further came of their nesting, but Mr. Barnby Smith records :—

"These Tree Partridges are absolutely hardy (sleeping out in the open during the most severe weather without suffering) and they are easily kept on grain, without any insect food, though they much relish this whenever they can get it.

"They are very active and sprightly birds, and scratch about constantly with the greatest vigour, far more than any other Tree Partridge I know. They seldom perch during the day time, but always roost a good height from the ground."

General Habits.—With the exception of what Davison has told us, there is nothing on record about the Tennasserim Red-throated Hill Partridge. He remarks :—

"This species is very abundant about the higher slopes of Mooleyit, keeping to the forest in small coveys of 10 or 12. When flushed by a dog or otherwise, they almost always fly up, and perch on the surrounding trees, where they squat and commence softly calling to each other. I have shot 3 or 4 when thus perched before the others have attempted to move, and I have had them perch within a few feet of me, and keep staring at me, softly whistling all the time. Their ordinary call is a series of double whistles, commencing very soft and low, but gradually becoming more and more rapid, and rising higher and higher, until, at last, the bird has to stop. As soon as one stops, another takes up the call. The call is very easily imitated, and, after a covey has been dispersed, it is not difficult to attract them by imitating the call.

"I have done so more than once with complete success. The birds chiefly call in the mornings and evenings, remaining quiet, as a rule, during the day.

"They feed on insects, small land shells, fallen berries, and various seeds, and are fond of scratching about among the dead leaves."

Arboricola mandellii.

The Red-breasted Hill Partridge.

Arborophila mandellii—Hume, S.F., ii, p. 449, (1874), (Bhutan Doars) ; id, ibid, iii, p. 262, (1875).

Arboricola mandellii—Hume and Marsh, Game-B., ii, p. 83, (1879) ; id, S. F., viii, p. 111, (1879) ; Ogilvie-Grant, Ibis, 1892, p. 394 ; id, Cat. B. M., xxii, p. 214, (1893) ; id, Hand-L., Game-B., i, p. 167, (1895) ; Oates, Man. Game-B., i, p. 143, (1898) ; Bailey, J. B. N. H. S., xxiv, p. 78, (1915) ; Inglis, ibid, xxvii, p. 154, (1920).

Vernacular Names.—Pao-Er (Chulikatta Mishmi).

Description.—Forehead, lores and forecrown dull chestnut, shading brown on hind crown and nape ; dark, pure grey superciliary stripes

from above either eye to the upper neck where they meet ; lower neck or extreme upper back chestnut ferruginous with black spots ; back, rump, upper tail-coverts and tail olive with narrow black edges, and all but the back with bold black central spots ; scapulars and wing-coverts like the back but with still finer black bars ; wing quills brown, outer secondaries with mottled rufous and brown outer webs ; inner secondaries and greater coverts with chestnut edges, faint grey patches, and bold, black terminal spots.

Below chin and throat pale olive chestnut, followed by white and black rings ; a small white moustachial streak, sides of head a darker chestnut, forming a collar with the chestnut on the neck and spotted with black in the same way ; upper breast deep rich chestnut ; from lower breast to vent grey, the flanks marked with chestnut in varying degree, and also more or less spotted with white ; the centre of the abdomen is often paler, and sometimes ashy in tint. Under tail-coverts olive, with white spots and rufous tips and markings ; the thigh-coverts and extreme posterior flanks are often olive with black centres and rufous markings.

Colours of Soft Parts.—Bill black ; irides red-brown.

Measurements.—Total length about 275 mm. ; tail about 56-58 mm. ; wing from 133 to 145 mm., the average of 7 being 137 mm. ; tarsus 43 to 45 mm. ; bill at front 19 to 20 mm.

The female only differs in being a little smaller, but the material available does not suffice to give details.

Distribution.—The hills North of the Brahmapootra from Sikkim and Bhutan to the East of Assam. Bailey obtained a specimen on the upper Dibong Valley and Needham gave me some specimens from the hills North of Sadiya.

Nidification.—Nothing recorded, but my collectors sent me a skin of a female together with 4 eggs and notes to the following effect. The eggs were laid on the ground under shelter of a rock, but with practically no nest beyond a grass pad, in evergreen forest interspersed with Rhododendron and Oak, the ground much split up into ravines and cliffs, very rugged and very wet and humid in spite of the elevation, which was about 8,000 feet in the Chambi Valley.

The eggs differ in no way from those of other species of *Arboricola* and measure about 43 by 34 mm. They are probably quite abnormally big eggs.

They were taken on the 3rd June.

Habits.—The Red-breasted Hill Partridge is found principally between 3,000 and 6,000 feet, descending a good deal lower in the Cold Weather, though it never seems to come actually into the Plains. In the summer it must often ascend much higher than 6,000 feet, for the nest taken for me in the Chambi Valley could not have been lower than 8,000 feet, and may have been a good deal higher. In some nests taken by Mr. H. Stevens at altitudes a good deal over 6,000 feet, I

found feathers of this bird used in the linings on several occasions. Mr. Masson also informed me that it bred on some of the ranges beyond Darjiling, at heights between 7,000 and 9,000 feet, though he failed to procure nests or eggs.

There is nothing known about its habits, but it is undoubtedly a bird which frequents dense, damp forests, and probably keeps much to those which have streams or rivers running through them.

Arboricola atrogularis.

The White-cheeked Hill Partridge.

Arboricola atrogularis—Blyth, J.A.S.B., xviii, p. 819, (1849), (Assam, Sylhet) ; id, Cat., B. Mus. As. Soc., p. 253, (1849) ; id, J. A. S. B., xxiv, p. 276, (1856) ; Jerd., B. of I., ii, p. 579, (1864), (Tippera and Chittagong); Blyth, Ibis, 1867, p. 159; Hume, S. F., v, p. 44, (1877); Anderson, B. of Yunnan, ii, p. 673, (1878) ; (Kachin Hills) ; Hume and Marsh., Game-B., ii, p. 79, (1879), Hume, S. F., viii, p. 3, (1879) ; id, ibid, xi, p. 306, (1888) ; Oates ed. Hume's N. and E. iii, p. 439, (1890) ; Ogilvie-Grant, Ibis, 1892, p. 393 ; id, Cat. B. M., xxii, p. 209, (1893) ; id. Hand-L. Game-B., i, p. 163, (1895) ; Blanf., Avifauna, B. I., iv, p. 127, (1898) ; Oates, Man. Game-B., i, p. 145, (1898) ; Stuart Baker, J. B. N. H. S., xii, p. 492, (1899) ; (N. Cachar) ; Oates, Cat. Eggs B. M., i, p. 42, (1901) ; Stuart Baker, J. B. N. H. S., xvii, p. 971, (1907), (Khasia Hills) ; Barnby Smith, Av., Mag., i, p. 128, (1909) ; Hopwood, J. B. N. H. S., xxi, p. 1215, (1912), (Arrakan) ; Stevens, ibid, xxiii, p. 724 ; (1915), (Dafla and Miri Hills) ; Hopwood and Mackenzie, J. B. N. H. S., xxv, p. 91, (1917), (N. Chin Hills).

Arborophila atrigularis—Hume, S. F., ii, p. 449, (1874).

Vernacular Names.—Peura (Sylhet) ; *Duboy*, *Dubore*, (Assamese) ; *San-batai*, (Chittagong) ; *Dao-bui* or *Daobui-yégashi* (Cachari) ; *Inruiwhip* (Kacha Naga) ; *Toung-kha*, (Burmese) ; *Wo-gam* or *Gam-toung* (Kachin).

Description.—Forehead grey, changing to olive-brown on the crown, and again into rufous on the nape, all the feathers with broad black spots ; the grey of the forehead is produced backwards as a supercilium, and beneath this there is a black line, connecting with the black lores and upper cheeks ; back, rump and upper tail-coverts light olive-brown, the feathers edged at the tips, and with bars of black ; scapulars the same but greyer and innermost secondaries also similar but with bold terminal black bars and edged and mottled with rufous ; wing-coverts olive-grey mottled with brown, and sometimes, especially on the greater coverts, with a certain amount of rufous ; quills brown, inner secondaries mottled with rufous and brown on the outer webs, which are greyish towards the tips. Tail mottled olive and brown. Cheeks from bill to ear-coverts white, passing into rufous on the posterior ear-coverts, and with a few very fine black shaft-lines ; chin, throat and foreneck black ; lower neck black and white ; breast and

flanks grey, passing into whitish on the centre of the abdomen ; posterior flanks with white drops ; under tail-coverts rufescent with white edges and black spots.

The spotting on the breast and flanks varies very greatly. A bird from Dibrugarh has numerous bold black and white spots on the breast, but other birds from the same place are quite normal.

Colours of Soft Parts.—Bill black ; irides brown or red-brown ; orbital and gular skin bright pink, becoming a brilliant deep red in the breeding season ; legs dull orange to a bright orange-red, or red, during the spring and summer. The females never have the legs so red and they are normally a dull waxy-yellow to a rather dark wax-yellow very rarely at all tinged with red. In this sex also the bill is browner, especially at the base.

Measurements.—Total length about 275 mm. ; tail about 60-65 mm.; wing 135 to 147 mm., averaging about 140·5 ; tarsus 42 to 44 mm. ; bill at front 18 to 20 mm. The female is a good deal smaller ; the few properly sexed skins I have been able to examine had wings varying from 126 to 130 mm., and averaged only 129 mm. A larger series would probably range somewhat larger.

Distribution.—Assam, South of the Brahmapootra, and also to the North-East in the Dafla and Miri Hills, where it was obtained by Godwin Austen, and recently in some numbers by H. Stevens. It extends through Cachar and Sylhet, Tippera and Chittagong into Arrakan, the Chin and Kachin Hills. It has been obtained at Mytikyna by Whitehead at 3,500 feet, by Bateman at Kamdoung and in the Kachin Hills by Anderson. Dr. Coltart and I found it very common in Margherita in extreme East Assam, and I repeatedly saw it in Sadiya, where Cockburn also got it very many years ago.

Nidification.—The White-cheeked Hill-Partridge breeds from the level of the Plains up to at least 4,000 feet, but is most often found at or below 2,000 feet. I have had its eggs brought to me more than once in the Barail Hills at nearly 5,000 feet, but it is only a rare breeder there. In Cachar, Sylhet and Assam its favourite breeding haunts are the broken hills and ravines at the foot of the higher hills, and it also nests freely in the scrub-covered hills, or tilaps which lie isolated and some distance away from the main hills. In the Khasia Hills it is most common at 2,000 feet and under, but is found right up to Shillong itself, and I have taken its nest from the hills overlooking the race-course at nearly 5,000 feet.

The breeding season is principally April and May, but in the plains a few birds start breeding in March, and in the higher ranges it continues well into June, second broods often being reared in July and even August.

It builds its nest in forest, bamboo or scrub jungle or grassland, and does not adhere nearly so strictly to dense tree forest as do so many of the genus. I have taken its nest in Cachar in thin scrub and quite

open bamboo jungle, in light secondary growth, and in cotton cultivation, and in the Khasia Hills I have more than once taken the nest in the short grass, anything from one to three feet long, covering so many of the hills between 3,500 and 4,500 feet. Sometimes it makes a most elaborate nest, this is especially the case when it lays in grass or bracken covered country. The nest itself is a mere hollow scratched amongst the roots of the grass, but it is well filled with grass and leaves form a soft pad with a well-formed depression in the centre for the eggs. Above the nest the grass is regularly twisted and interwoven so as to form a complete canopy or hood, and behind the grass is sufficiently beaten down and forced together to make a back which entirely hides the eggs from view. In front the same process is repeated, but a tunnel is left by which the bird enters and leaves the nest and which is often a couple of feet long. When nesting in scrub the nest is much simpler and generally nothing more than a well-lined hollow. For the purpose of this lining I have never seen anything used but grass and leaves and dead fern fronds, but Cripps speaks of twigs in the two nests found by him. In bamboo jungle the eggs are generally laid on the bamboo leaves which have fallen into some natural hollow under the protection of a clump of bamboo, tree or bush.

The number of eggs laid is most often 4, sometimes 5, rarely 6, and very rarely 7. They are undistinguishable from those of the other species of *Arboricola*, and like them, vary very greatly in size. 100 eggs average in size 37·6 by 28·4 mm., and the maxima are 42·6 by 28·4 mm. and the minima 32·4 by 26·2 mm., both maxima and both minima being found in the same egg.

Habits.—This little Partridge is undoubtedly the low-level representative of the genus *Arboricola*. True it is sometimes found at considerable altitudes throughout its range, but typically it is a bird of 2,000 feet and under, and, though it may not be found in real plains country, it is most common in the broken foot hills of the higher ranges and South of the Brahmapootra whenever this broken, hilly kind of land is to be met with, the White-cheeked Hill-Partridge is almost sure to occur. In Sylhet it is found commonly on all the isolated patches of hills well away from the main ranges and in the Assam Valley much the same obtains. Unlike its brethren also, this Partridge is not so much a frequenter of dark, damp forests of mighty, densley growing trees. It probably prefers to all other kinds of cover the sparse scrub growth which is found in deserted cultivation where the hill soil is poor and stony. It is also very partial to bamboo jungle of any kind, and may often be found in quite open grassland as long as this is fairly near forest or jungle of some kind, for, when disturbed, it always flies straight to cover for protection.

It is generally found in small coveys consisting of a pair of old birds and their last brood, for the families remain united until it is time to again think of the burdens of house-keeping. They, however, when

feeding, straggle a great deal and wander far from one another, though they keep in touch by means of the usual soft low whistle. If danger is near the whistling ceases at once, and as they lie very close and don't rise until almost trodden on, anyone disturbing one bird may easily miss the rest. This has probably given rise to the idea so generally met with that they are solitary birds. Should one be put up and fly off, if the disturber of the peace will only stand absolutely still for a few minutes, he will presently hear a mellow low whistle somewhere near, and this will be taken up and replied to from all quarters until each bird has located his fellows. This call is very soft and quite inaudible to human ears unless one keeps very still, but the whistle during the breeding season is a very beautiful, loud clear double note, audible at very great distances.

They fly at a good rate, dodge about considerably, and have a habit of hurling themselves suddenly into cover or from one side to another, which is very disconcerting to a would-be shooter, but often they will fly a considerable distance when put up before seeking shelter. They perch readily and constantly, but perhaps not so frequently as some of the others of their kind, and during the day I think they often lie up in scrub and grass rather than roost on trees and bamboos.

Their food is the same as that of all other *Arboricolas*, both insects and seeds, etc., and for the table they form quite a respectable dish, for they are nearly always fat and in good condition.

Arboricola brunneopecta.

The Brown-breasted Hill Partridge.

Arboricola brunneopectus—Tick., Blyth, J. A. S. B., xxiv, p. 276, (1855), (Tennasserim) ; Hume, S. F., ii., p. 482, (1874) ; Hume and Davis, ibid, vi, p. 443, (1878), (Kyouknyat) ; Hume, ibid, viii, p. 111, (1879) ; Hume and Marsh, Game-B., ii, p. 87, (1879), (Tounghoo) ; Bingham, ibid, ix, p. 195, (1880), (Dauna Range) ; Oates, ibid, x, p. 236, (1882) ; (Pegu) ; Ogilvie-Grant, Ibis, 1892, p. 397 ; id, Cat., B. M., xxii, p. 216, (1893) ; id, Hand-L., Game-B., i, p. 169, (1895) ; Oates, J. B. N. H. S., x, p. 112, (1895), (Ruby Mines) ; id, Game-B., i, p. 133, (1898) ; Blanf., Avifauna, B. I., iv, p. 128, (1898) ; Hopwood, J. B. N. H. S., xviii, p. 433, (1908), (Chindwin) ; Harington, ibid, xix, p. 365, (1909), (Rangoon) ; Barton, J. N. H. S., Siam, i. No. 2, p. 108, (1914), (Raheng, Siam) ; Gyldenstolpe, Kang. Sven. Vet., Acad. Hand-L., 56, p. 156, (1916), (N. W. Siam).

Arboricola brunneipectus—Blyth, Ibis, 1867, p. 159 ; Blyth and Wald., Cat, M. and B., Burma, ii, p. 325, (1883) ; Oates, B. of Burm., ii, p. 325, (1883).

Arborophila brunneopectus -Hume, S. F., ii, p. 449, (1871) ; id, ibid, iii, p. 174, (1875) ; Walden, Ibis, 1875, p. 459.

Vernacular Names.—*Wo-gam*, (Kachin) ; *Toung-kha* (Burmese).

Description.—Forehead and broad supercilia running down the sides of the neck buff, palest on the neck ; lores and two lines above and below the eye and a broad patch on each side of the neck, black ; crown olive-brown, each feather black-tipped, the black spots sometimes coalescing so as to make the crown almost wholly black ; nape generally blacker than the crown ; back, rump and upper tail-coverts bright olive-brown with black bars, varying a good deal in width, but always less well-defined on rump and upper tail-coverts ; tail olive-brown with black mottling ; scapulars, wing-coverts and inner secondaries chestnut with black drops or bars and large oval patches of pale olive-brown ; primaries brown mottled near the tips with rufous, and outer secondaries the same with broad rufous edges, becoming chestnut-rufous on the inner ones. Chin, cheeks and ear-coverts white or buffy white ; foreneck sparingly covered with black feathers with narrow white bases ; breast and flanks brownish buff, the feathers with more rufous edges ; flanks with round white spots and black bars ; abdomen almost white ; under tail-coverts pale buff with broad black bars or spots.

The feathers of the breast have broad black bases which sometimes show through.

Colours of Soft Parts.—Iris dark brown ; eyelids, orbital skin and gular skin bright red, red lake, or bright fleshy red ; legs and feet pale bright red ; bill brownish black or black.

Measurements.—Total length about 280 mm. ; wing, males from 132 to 151, and on an average about 144 mm., females, from 122 to 139 mm., with an average for 13 birds of about 134 mm. ; tarsus 39 mm., in females to 42 mm. in males ; bill about 20 to 21 mm. ; tail 60 to 70 mm.

Distribution.—Pegu and Eastern Burma, North to the Ruby Mines, through the Karen Hills into Western, and North-Western Siam and the South Shan States. Capt. Venning shot it 10 miles N. E. of Myitkyna, and Harington obtained it breeding near Rangoon.

Pegu birds are very small, and have the backs much less marked with black than have birds from elsewhere, and the brown of the breast also seems to be darker and duller. There are, however, only three specimens from Pegu in the Nat. His. Museum and the differences may be only individual, though I can find none like them amongst the 40 specimens I have examined from other tracts.

Nidification.—Although this is a comparatively common bird over a great area, nothing is recorded of its breeding habits beyond Harington's brief note " breeds at Tauckhan in June."

The eggs taken at this place and now in my possession are typical *Arboricola* eggs in every way, and measure about 37·3 by 28·4 mm. Harington in a letter wrote me as follows :—

> " I have at last got the eggs of *A. brunneopectus*, they were found by my man at Taukchan near Rangoon in open bamboo

jungle, and were laid on the ground in a hollow well filled in with bamboo leaves and grass. I went out and took them myself, and shot a specimen of this Partridge close by, although not actually off the nest, and I have no doubt as to their authenticity."

These eggs were taken in June.

Habits.—The Brown-breasted Hill Partridge is a bird of comparatively low levels, and will be found principally in the broken, hilly country bordering the plains, and thence commonly up to some 3,000 feet, and, again, some way into the plains themselves. On the other hand they have been shot at some 5,000 feet, and occasionally may be found to wander up even higher than this.

They keep in small coveys of 4 or 5 to 8 or 9 birds, probably just the parent birds and their last brood, though possibly two families may sometimes join forces. Typically they are frequenters of dense forest with heavy undergrowth, but will now and then be seen—as with those shot by Col. Harington—in bamboo and scrub jungle.

Although it has been obtained so often since Hume's days, no one has recorded anything about their habits. Darling wrote about that time :—

"There was not a day at Thoungyah that I did not see two or three coveys of this Partridge, counting each from 3 to 10, or even more birds ; but owing to their shyness and dead leaf colour, they are very difficult to secure. They feed among the dead leaves on seeds, insects, and small shells, and are very restless, giving a scratch here, a short run and another scratch there, and so on, uttering a short cooing whistle the whole time. When disturbed by a man, they always disappeared into the dense undergrowths, but a dog always sent them flying into some small tree, whence they would at once begin calling to one another, whistling at first low and soft, and going up higher and shriller, till the call was taken up by another bird. I often got quite close to them, but the instant I was seen, away they ran helter skelter in all directions, and I could only now and then catch a glimpse of the little fellows scuttling through the bushes. Of course they are entirely a forest bird, though they may be seen just at the outskirts of this."

Oates found this bird and *Tropicoperdix chloropus* very common in the densely-wooded ravines and nullahs of the evergreen forests on the Eastern slopes of the Pegu hills, but he never found the two birds together in the same area "each species appearing to occupy one stream to the exclusion of the other."

Tickell refers to their making a curious low "pur r r" not unlike the call of the Button Quail as they wandered about feeding in the undergrowth. No one else seems to have heard any of the other Wood-Partridges making a sound of this nature.

Genus—TROPICOPERDIX, Blyth, 1859.

The birds of this genus are distinguished from those of the genus *Arboricola* by the absence of the chain of peculiar supraorbital ossicles, and by having a patch of downy white feathers on each side behind the axilla.

There are only two species one of which is found in Burma.

Tropicoperdix charltoni appears to me to be a good species and not a sub-species of *T. chloropus*.

Tropicoperdix chloropus.

The Green-legged Hill Partridge.

Tropicoperdix chloropus—Tick., J. A. S. B., xxiv, p. 415, (1859), (Tennasserim); Ogilvie-Grant, Game-B., i., p. 172, (1895); id, Ibis, 1895, p. 278; Blanf., Avifauna, B. I., iv, p. 129, (1898); Harington, J. B. N. H. S., xix, p. 310, (1909), (Bhamo); Gyldenstolpe, Kungl. Svenska. Vet. Akad., 50, No. 8, p. 67, (1913), (Siam); Robinson, Ibis, 1915, p. 721, (S. E. Siam); id., ibid, 1919, p. 407, (Cochin China).

Arboricola chloropus—Tick., J. A. S. B., xxviii, p. 453, (1859), (Amherst); Hume, S. F., ii, p. 482, (1874), (Pakpoon); Blyth and Wald., Cat. M. and B. Burma, p. 150, (1875), (Jummee River); Hume and Dav., S. F., vi, p. 444, (1878), (Tennasserim); id., ibid, viii, p. 111, (1879); Hume and Marsh, Game-B., ii, p. 91, (1879), (Tonghoo); Bigham, S. F., x, p. 236, (1882), (Pegu); Oates, B. of B. B., ii, p. 326, (1883), (Pegu); Ogilvie-Grant, Ibis, 1892, p. 398; id., Cat, B. M., xxii, p. 219, (1893); Oates, Game-B., i, p. 151, (1898).

Phoenicoperdix chloropus—Hume, S. F., ii, p. 482, (1874); id., ibid, vi, p. 447, (1878), (Moulmein).

Arborophila chloropus—Hume, S. F., ii, p. 449, (1874).

Peloperdix chloropus—Hume, S. F., iii, p. 176, (1878).

Arboricola chloropus chloropus—Gyldenstolpe, Ibis, 1920, p. 735, (Siam).

Vernacular Names.—None recorded.

Description.—Feathers of forehead, lores and supercilia dark brown with white outer webs; the supercilia extend down the sides of the neck, changing gradually to pale buff with black edges; crown and nape brown, in some individuals tinged olive, in others more rufous; upper parts brown, tinged with rufous with narrow crescentic black bars and the rump and upper tail-coverts with fine black stippling as well as a varying amount of buff mottling; tail rufous-brown with bars and mottle of black; wing covers, scapulars and inner secondaries like the back, but with a few paler mottlings and with more rufous on the secondaries; primaries brown; axillaries white; under wing-coverts brown and white; a tuft of downy white feathers on each flank.

Chin, throat and sides of head white, each feather with a black spot at the tip; neck and sides bright rufous similarly spotted; breast brown

like the back, immaculate next the neck, with wavy black bars on the upper breast, changing to ferruginous red on the lower breast and to very pale rufous-white on the abdomen ; flanks brown, mottled, barred and streaked with fulvous and black ; the latter often extended on to the lower breast, as black margins to the feathers.

Colour of Soft Parts.—Bill apple-green or horn-green, dusky-red at the base and with the tip a little darker ; iris brown or red-brown ; eyelids and orbital skin purple-red ; legs dull greenish, greenish yellow or apple-green ; claws yellow-horny.

Measurements.—Wing, males from 152 to 166 mm., average 157, female, 148-158, average 153 mm. ; the tarsus measures from 43 to 45 mm. and the bill from the forehead 18-19 mm. ; tail about 76 mm. The total length is about 300 mm.

" Weight, 8 to 10 ozs." (Hume).

Distribution.—Eastern Pegu and Tennasserim as far South as Tavoy. To the North it evidently will eventually be found throughout Eastern Burma and the Western Shan States. Harington obtained it at Bhamo and Khamaing, Major Whitehead and Harington both shot it at Myitkyna and Major Nisbett got it much further North again at Katha. In Siam Gyldenstolpe reports it as " fairly abundant in the Northern Hill Forests ; also recorded from Klong Menao in the Eastern parts of the country, and Gairdner states that it occurs in the provinces of Ratburi and Pechaburi." It extends East into Cochin China.

Nidification.—Nothing recorded.

Habits.—Col. Tickell, who discovered this little partridge in Tennasserim, wrote as follows concerning its habits, etc., in that portion of Burma :—

> " It appears tolerably numerous, but, as far as my observations go, is entirely confined to the forests on the banks of the Zamme River. Unlike its known congeners, it avoids mountains and inhabits low, though not humid jungles, where the ground merely undulates or rises into hillocks. Like the rest of its tribe it is difficult to flush, and runs with great rapidity, jumping adroitly over obstacles, and diving into impenetrable thickets for security. Early in the mornings these birds come out on the pathway, scratching about amongst the elephants' dung and turning over the dead leaves for insects. They do not appear to have any crow or call, but in the pairing season this may not be the case. The Karens do not even know the bird, but this is no proof of its rarity, for these people pay no attention to the living products of their forests.
>
> " The sexes are precisely similar in plumage and size ; the flesh is rather dry and tasteless."

Oates' experience of these birds differed considerably from Col. Tickell's, for he found them only in the steepest ravines and valleys, and nearly always in dense evergreen growth.

Davison, however, also says that he found them most abundant in thin tree jungle as well as in thick forest. In Tennasserim, he met them generally in pairs, and occasionally in small parties, and he describes habits, voice, etc., all as being very much like that of the partridges of the genus *Arboricola*.

Harington found them only in dense forests at considerable elevations, as did Nisbett and Whitehead, and they were always in the thickest of the evergreen cover and never in thin forest.

Genus—CALOPERDIX. Blyth, 1865.

In addition to possessing no supraorbital ossicles, this genus is differentiated very definitely both from *Arboricola* and *Tropicoperdix* by the formation of its legs. The tarsus is considerably longer than the middle toe and claw together, and is armed with one or more spurs. The feet are short and the claws, though straight, are much shorter. The wing is rounded as in *Arboricola*, and the tail consists of only 14 feathers.

It ranges from Java, Borneo and Sumatra, through the Malay Peninsula into Western Siam and Tennasserim.

Very little is as yet known concerning its habits, etc., which will, however, probably be found to very closely approximate those of the genus *Arboricola*.

Caloperdix oculea oculea.

The Ferruginous Wood Partridge.

Perdix oculea—Temm. Pig. et. Gall. iii, pp. 408 and 732, (1815); (Sumatra) ; Gray in Hardw. Ill. In. Zool., i, pl. 58, (1830-32).

Cryptonyx ocellatus—Vig. Zool. Jour., iv, p. 349, (1829).

Rollulus ocellatus—Blyth, Cat., B. M. A. S., p. 253, (1849), (Tennasserim).

Caloperdix oculea—Blyth, Ibis, 1867, p. 160, (Mergui) ; Hume, S. F., iii, p. 325, (1875), (Bankassoon) ; Hume and Dav., ibid., vi, p. 449, (1878), (Malewoon) ; Oates, B. of B. B., ii, p. 329, (1883), (Malay Pen.) ; Ogilvie-Grant, Cat., B. M., xxii, p. 222, (1893) ; id., Ibis, 1894, p. 376 , id. Hand-L. Game-B., i, p. 129, (1898) ; Robinson and Kloss, Ibis, 1910, p. 671, (Trang).

Caloperdix ocellata—Blyth and Wald., Cat. M. and B. Burma, p. 151, (1875), (Mergui).

Caloperdix oculeus—Hume, S. F., viii, p. 69, (1879), (Malacca); Hume and Marsh., Game-B., ii, p. 101, (1879), (Moulmein) ; Hume, S. F., ix, p. 121, (1880), (Kopah).

Francolinus oculeus—Ogilvie-Grant, Ibis, 1892, p. 50.

Caloperdix oculea oculea—Gyldenstolpe, Ibis, 1920, p. 736, (Trang and Bandon).

Vernacular Names.—None recorded.

Description.—Whole head, neck and lower parts, bright ferruginous red ; the crown deeper and more chestnut ; chin, throat and sides of head, albescent and supercilia also paler ; upper back black, with two sharply defined white bars on each feather ; lower back, rump and upper tail-coverts black with bright rufous-pink V-shaped central markings ; tail black, the central rectrices with narrow sub-terminal rufous bars ; scapulars, wing-coverts and innermost secondaries light olive-brown with bold sub-terminal black spots ; quills, grey-brown, the outer secondaries tipped and edged with rufous mottlings ; flanks black with white bars ; posterior flanks ferruginous with black drops ; centre of abdomen and vent whitish ; under tail-coverts pale ferruginous and black.

Colours of Soft Parts.—Iris dark brown, bill black ; legs and feet pale dirty-green to rather clear apple-green.

Measurements.—Total length about 275 mm. ; tarsus 47 to 48 mm. ; bill from front 20 to 21 mm. ; tail 65 to 70 mm. ; wing, males, 143 to 151 mm. ; average about 146·6 mm. ; females 134 to 140 mm. ; average 138·0 mm.

Distribution.—The Northern Malay Peninsula, extending into Tennasserim, Siam and Northward to at least 100 miles North of Tavoy where it has been obtained by Hopwood. In Siam it was obtained by Mr. E. G. Herbert's collectors and Gairdner states that it occurs in Ratburi and Petchaburi.

Nidification.—Nothing known at present.

Habits.—All that Hume could find to record of this Partridge was as follows :—

> " A denizen of dense and uninhabited forest, where the tracts of wild elephants, buffaloes and the Saladang (Bos sondaicus ?) constitute the only pathways, nothing absolutely seems to be known of its habits. My collectors have succeeded in snaring a few specimens, and have ascertained that it feeds on insects, seeds and berries, but they have never even seen it wild, nor have they been able to procure any information about it or its nidification from the Malays."

Since the above was written over 50 years ago, but little has been added to our knowledge. However, recently, Mr. C. Hopwood, Conservator of Forests, has been so fortunate as to personally come across this Partridge in its native haunts. In a letter to me, dated 30th January 1918, he writes :—

> " Yesterday I got a fine cock *Caloperdix oculea* near the head waters of the Tavoy River, 100 miles North of Tavoy, which extends its hitherto recorded habitat 300 miles or so to the North of that given by Davison, Bankasun, Victoria Point. It is presumably to be found over the whole of Tennasserim at least up to the Douna Range which forms the watershed of the Tavoy, Ye and Thaungyin Rivers. Before I was successful in getting

this specimen I twice saw Partridge running in the jungle which were probably this species, not far from where it was got. In all three cases the birds were quite alone, at all events I saw no others with them, and am sure I should have spotted them had there been any others in their company. To-day, however, I came on several of these little Partridges feeding on wild figs; there were a dozen or, perhaps, 20 birds altogether, out of which I succeeded in bagging two, and I hope soon to get more. The birds are not gregarious, I think, the number seen together being merely owing to the fact of the fallen fruit having furnished so great an attraction. From what the natives say, they must be very numerous here."

Genus—RHIZOTHERA.

The genus *Rhizothera* contains but one species of partridge containing two races, *R. l. longirostris* from the Malay Peninsula, etc., and *R. l. dulitensis* from the mountains of Borneo. Its long, heavy and much bent down bill at once distinguishes it from all other Indian Partridges. It has 12 tail feathers, a short rounded wing, the 5th and 6th primaries sub-equal and longest, and the 1st about equal to the 10th; the tarsi are stout and long, and are furnished with short blunt spurs in both sexes ; the claws are straight but small, and there is a small hind claw. The sexes are different to one another in colouration.

Very little is recorded about their habits.

Rhizothera longirostris longirostris.

The Long-billed Wood Partridge.

Perdix longirostris—Temm. Pig. et Gall., iii, pp. 323 and 721, (1815), (N. Sumatra).

Francolinus longirostris—Steph. In. Shaws, Gen. Zool., xi, p. 317. (1819) ; Gray, Ill. Ind. Zool., ii, pl. 45, (1833-4).

Tetrao curvirostris—Raffl., Trans. Lin. Soc., xiii, p. 323, (1822). (Sumatra).

Rhizothera longirostris—Gray, List Gen. B., p. 79, (1841) ; Kelham, Ibis, 1882, p. 4 (Perak) ; Ogilvie-Grant, Cat. B. M. xxii, p. 183, (1893) ; id., Hand-L., Game-B., i, p. 142, (1895) ; Sharpe, Ibis, 1893, p. 552. (Borneo) ; id., Ibis, 1894, p. 546 (Mt. Dulit) ; Inglis, J. B. N. H. S., xxvi, p. 291 (1918), (Tennasserim), Gyldenstolpe ; Ibis, 1920, p. 736, (Siam).

Rhizothera curvirostris—Blyth, Cat. B. M. A. S., p. 252, (1849), (Malacca).

Ortygornis longirostris, Reichenl., Syst, Av., pl. xxviii, (1852).

Vernacular Names.—None recorded.

Description. Adult Male.—Crown and nape rich chocolate-brown, palest on forehead ; lores, supercilia and sides of head and neck rusty chestnut ; a line from the nostrils through and over the eye black ; a

second black line at the edge of the base of the upper mandible ; back of the neck grey, the feathers boldy edged with velvety black and with a few longitudinal and cross bars of chestnut ; upper back reddish-brown with black blotches, the feathers margined rufous on either web; the feathers on either side of the back with pale buff central streaks ; lower back and rump vermiculated buff and pale grey with a few scattered black specks and spots; upper tail-coverts and tail same, but more rufous, and the mottlings forming ill-defined bars on the latter ; scapulars mostly buff with rufous brown edges and grey mottling ; innermost secondaries chestnut-brown with deep, red margins, black spots on the inner webs, buff tips and much mottled with buff and grey; wing-coverts buff, mottled with grey and brown ; primaries brown, mottled with chestnut-buff on the outer webs ; outer secondaries buff with mottled brown bars.

Chin and throat like the sides of the head but paler ; neck and upper breast grey, changing into rufous-buff on the lower breast and flanks, and again to almost pure white on the abdomen and vent ; under tail-coverts pale rufous.

Colours of Soft Parts.—" Iris burnt umber ; bill black, legs lemon-yellow " (Herbert).

" Bill black, legs flesh colour, claws horny " (Hopwood).

Measurements.—Length about 220 mm., tail about 80 to 90 mm., wing from 189 to 211 mm., average 10 birds, 197·5 mm. ; tarsus 55 to 63 mm. ; bill at front 28 to 33 mm.

Adult Female.—Differs from the male in having nearly all the grey of the neck and breast replaced by rufous-chestnut ; the rump, upper tail-coverts and tail are generally more rusty and less grey, and the rusty of the lower part is deeper and more extensive.

Colours of Soft Parts.—Apparently as in male.

Measurements.—Wing 180 to 202 mm., average 8 birds, 190 mm. ; tarsus 54 to 58 mm., bill 24 (possibly juv.) to 33 mm.

Young Male is like the female, but retains traces of barring on the feathers of the breast and flanks, and probably this barring is still more extensive in the quite young bird.

In this Partridge the depth and extent of the rufous on the head and upper parts varies considerably in both sexes ; in the female practically the whole of the underparts are sometimes rufous, but occasionally in this sex and more often in the male the abdomen is extensively white.

Distribution.—S. W. Siam and Tennasserim throughout the Malay Peninsula to Sumatra and West Borneo ; but replaced in some of the mountains of Borneo by another race, *dulitensis* of Ogilvie Grant. I cannot discover any difference between birds from Sumatra and those from the most Northern parts of its range.

There are two birds in the British Museum collection labelled " China, " possibly meaning Cochin China.

Nidification.—Nothing recorded.

Habits.—Mr. Hopwood obtained a specimen of this species from a Mr. French, who shot it almost 15 miles from a place called Bokpyin, half-way between Mergui and Victoria Point in bamboo jungle. Bokpyin is about 150 miles South of Mergui.

Mr. N. C. Robinson, to whom the bird was eventually sent for identification, when returning it, sent also the following note :—

> " The Long-billed Hill-Partridge . . . is common over the whole of the Malay Peninsula in suitable localities, and also in Borneo and Sumatra in slightly modified forms. In the Malay Peninsula it is an inhabitant of heavy jungle, usually dry jungle in which there is much bamboo up to 4,000 feet. It is very terrestrial and partly crepuscular in its habits. Its note is a loud, clear whistle, often heard at night."

(To be continued.)

SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

No. XXIX.

A Renaming of "*Mungos mungo ellioti*", Wroughton.

By the late R. C. Wroughton.

In 1915, when sorting out the races of the Common Indian Mungoose, *Herpestes edwardsi*, at that time known as *Mungos mungo*, I gave to the Dharwar form the name of *Mungos mungo ellioti*.*

But it has now been pointed out to me that in 1851† Blyth applied the name of *Herpestes ellioti*, to a Mungoose of the *H. smithii* group from South India, thus invalidating my use of the term.

Using the revised generic and specific names for the Common Mungoose, I would propose for the Dharwar race the name of *Herpestes edwardsi carnaticus*, with the same type specimen, B. M. No. 12, 6. 29, 44.

No. XXX.

The Mungooses of the *Herpestes smithii* group.

By Oldfield Thomas, F.R.S.

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During the course of the Survey a certain number of Mungooses have come which have been referred to *Herpestes smithii*, but they exhibit such a range of variation that I have thought it worth while to lay out all the available series, in order to see how far the variation is geographical.

The result proves highly interesting, as I find there are no less than five definable geographical races, which may all be considered as subspecies of *H. smithii*.

With regard to the names, we may first take in rotation those given in Blanford's Synonymy of *H. smithii*. Detailed references will be found in his work.

Herpestes smithii, Gray, 1837. Type in British Museum. No locality, but the type closely agrees with specimens from the Bombay region.

Herpestes thysanurus, Wagn., 1839. Said to be from Kashmir. Far too small to be a member of this group at all. No Mungoose with a black tip to the tail has been found in Kashmir, and it is probable there was some mistake as to the locality. An African Mungoose of the *H. gracillis* group would better fit the description.

Crossarchus rubiginosus, Wagn., 1841. Clearly not an *H. smithii* at all, but synonymous with *H. vitticollis*.

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* Journal, B. N. H. S., xxvi, p. 52, 1915. † J. A. S. B., xx, p. 162, 1851.

Herpestes ellioti, Blyth, 1851. Carnatic. Synonymous with true *smithii*.

Herpestes rubiginosus, Kelaart, 1852. nec *Crossarchus rubiginosus*, Wagn. The Ceylon form. Name invalid.

Herpestes jerdoni, Gray, 1864. The co-types, which were sent to the Museum by Jerdon, are apparently the same specimens as those from the " Eastern Ghats inland of Nellore " on which also was founded—

Herpestes monticolus, Jerd., 1867. Co-types and locality as last.

Herpestes torquatus, (Ell. M. S.) Jerd. Mamm. Ind. p. 136, 1867. From Carnatic ; same as *smithii*.

Of these names therefore *smithii*, *ellioti* and *torquatus* all refer to the form of Western Peninsular India, *jerdoni* and *monticolus* to that of the Western Ghats, the invalid *ribiginosus*, Kel., to the Ceylon race, while neither *thysanurus* nor *rubiginosus*, Wagn., have anything to do with the present group.

The following synopsis will give a clue to the races I should propose to recognise :—

A.—General colour darker and browner. A considerable number of hairs on body and limbs tipped with rufous.

a. Size averaging largest, though bullæ generally smaller than in next. Colour more richly rufous, the legs noticeably reddish.
Ceylon. 1. *H. s. zeylanius*, subsp. n.

b. Size averaging less than *a*, but bullæ generally larger. Colour dark, with less rufous tipping, the legs not conspicuously reddish, though the ankles often are.
Central and Western Continental India, from Hoshangabad southwards to the Nilgiris.
2. *H. s. smithii*, Gray.

c. Size decidedly smaller ; colour as in *b*.
N. E. Rajputana. 3 *H. s. rusanus*, subsp. n.

B.—General colour paler and greyer. Hardly any hairs, except on head and fore quarters, tipped with rufous.

d. General colour drabby greyish. Skull normal.
Eastern Ghats. 4 *H. s. jerdoni*, Gray.

e. General colour clear grizzled grey. Hairs of tail below tipped with yellowish. Skull usually depressed in posterior frontal region.
S. W. Rajputana ; Bengal. 5. *H. s. canens*, subsp. n.

urther notes on new forms—

Herpestes smithii zeylanius.

A large strongly coloured animal with a maximum number of reddish tipped hairs. Outer sides of hips and legs rich reddish, the red fading off below, and passing into the blackish brown of the terminal half of the foot.

Skull large, but the bullæ averaging smaller than in the continental animal.

Dimensions of type, measured by collector;

Head and body, 430 mm.; tail 375; hindfoot 74 mm.; ear 28 mm.

Weight 3¼ lbs.

Skull, condylo-basal length 89 mm.; zygomatic breadth 49.5 mm.; height of crown level with middle of zygoma 25.2 mm; length of bullæ 16.6 mm.

Hab. Ceylon. Type from Mankeni, Eastern Province.

Type. Adult Male B. M. No. 15, 3, 1, 57. Original No. 531.

Collected 2nd September 1913 by Major E. W. Mayor. Presented by the Bombay Natural History Society. Seven specimens seen.

The handsomest and most richly coloured form of the species.

Herpestes smithii rusanus.

Colour as in true *smithii*, but size decidedly smaller. Legs not markedly redder than the rest, while even the ankles are more brown than red. Hairs of proximal half of feet inconspicuously tipped with red.

Dimensions of type, measured on skin:—

Hindfoot 73 mm.; Skull, condylo-basal length 82 mm.; zygomatic breadth 44 mm.; height of crown 23 mm.; length of bullæ 17.3 mm.

Hab. of type. Sambhar, Rajputana.

Type. Adult male. B. M. No. 85, 8, 1, 44. Collected 13th January 1878 by R. M. Adam. Presented by A. O. Hume, Esq., C.B.

This appears to represent the extreme in the gradual reduction in size from South to North. Whether the *smithii* type goes further North we do not yet know, as the reported locality of Kashmir is apparently unreliable.

Herpestes smithii canens.

Size about as in true *smithii*. Colour clear grizzled grey without the drabby tone found in *jerdoni* or the brownish or rufous characteristic of the other subspecies; the general colour almost as in the paler races of the Common Mungoose.

Almost no hairs tipped with red, except on muzzle and ears. Legs and ankles brown, darkening to black on the feet. Tail light grey, its long hairs below broadly tipped with yellowish.

Skull of about the same length as in *smithii*, but the anterior half of the brain case is more flattened above in the two specimens examined.

Dimensions of type, measured in flesh:—

Head and body 445 mm.; tail 410 mm.; hindfoot 83 mm.; ear 32 mm.; weight 4 lbs.

Skull, condylo-basal length 88 mm.; zygomatic breadth 46.5 mm.; length of crown 22.5 mm.; length of bullæ 18 mm.

Hab. Mt. Abu, S. W. Rajputana. Alt. 4,300 feet.

Type. Old male with worn teeth. B. M. No. 13, 9, 18, 24. Original number 3370. Collected 3rd June 1913 by C. A. Crump. Presented by the Bombay Natural History Society. Two specimens.

A far greyer form than any other, evidently a native of a desert country.

A single female mungoose from Hazaribagh is also remarkably like the Mt. Abu animal, and must be provisionally assigned to the same subspecies.

No. XXXI.

BY

OLDFIELD THOMAS, F.R.S.

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TWO NEW RATS FROM ASSAM.

The late Mr. Wroughton had submitted to me some of the rats recently received from Assam for the Survey Collections and I find that the two following need description :—

RATTUS WELLSI, sp. n.

General size, and skull, smaller than in *mackenziei* (Journ. Bomb. N. H. Soc. xxiv, p. 409, 1916), though the hindfeet are as long as in that animal. Colour of the same iron-grey above and white below. Ears blackish. Hands white, feet with dark metatarsals and white digits. Tail with very fine scaling, about 13 rings going to the centimeter ; rather well covered with hairs ; dark brown above and below for four-fifths its length, the terminal fifth white all round.

Skull peculiarly smooth and rounded, with proportionately large braincase, the braincase about as large as in the much larger *bowersi*. Muzzle short and narrow. Interorbital space smooth, with scarcely any indication of lateral ridges. Interparietal large, strongly angular forwards. Palatal foramina shorter than in *mackenziei* ; bullæ about as in that species or a little larger.

Incisors pale yellowish, fairly orthodont, the index of the single example, 79 . Molars rather more bulky than in *mackenziei*.

Dimensions of the type, measured in the flesh :—

Head and body 197 mm, tail 220, hindfoot 48, ear 33.

Skull, greatest length 47·5 ; condylo-incisive length 45·2 ; zygomatic breadth 23·6 ; nasals 18·7 ×4·9 ; interorbital breadth 8 : breadth of braincase 20 ; interparietal 7·2 ×8·4 : palatilar length 22·5 ; palatal foramina 8·4 ; upper molar series 8·6.

Hab.—Khasi Hills. Type from Mawphlang ; alt. 5.500′.

Type.—Adult female B. M. No. 20·11·1·56. Original number 431. Collected 10th April 1920 by H. W. Wells and presented by the Bombay Natural History Society. One specimen only.

This rat is externally very like a small *R. mackenziei*, to which species it is probably most closely allied. But it is readily distinguishable by its smaller skull, its large smooth braincase and small muzzle. I have much pleasure in naming it after Mr. H. W. Wells, its collector, who has already done such good work for the Mammal Survey.

RATTUS LISTERI GARONUM, subsp. nov.

Essential characters as in true *listeri* of Darjiling, but the colour much more fulvescent, the upper surface, instead of brown (pale mars brown) being light ochraceous-tawny lined with blackish, more as in *R. edwardsi* and other members of this group.

Dimensions of the type :—

Head and body 232 mm. ; tail 305 ; hind-foot 46 ; ear 30.

Skull, greatest length 55 ; condylo-incisive length 50 ; zygomatic breadth 25 ; nasals 21·5 ; interorbital breadth 8·1 ; breadth of braincase 20·2 ; interparietal 7 × 14·3 ; palatilar length 23·8 ; palatal foramina 8·9 ; upper molar series 9·7.

Hab.—Tura, Garo Hills, Assam. Alt. 1,400′.

Type.—Adult female. B. M. No. 20·11·1·55. Original number 426. Collected 26th March 1920 by H. W. Wells. Presented by the Bombay Natural History Society. Six specimens.

Study of the further material now available of this group shows that the Darjiling *listeri*, the present Garo rat, and the Chinese *R. edwardsi* are all nearly related *inter se*, and are together distinguishable from the Malay *R. vociferans* by the greater breadth of the interparietal, which is less extended antero-posteriorly, by their more open choanæ, and by their tails being very much more finely scaled, the rings running from 9-10 to the centimeter as compared with 7-9 in *vociferans*.

In size however the Chinese form, which extends westwards into the Kachin region of Burma, markedly exceeds that of Darjiling and Assam, the skull being about 57—58 mm. in total, and 53—54 mm. in condylo-incisive length as compared about 54—55 and 50—52 respectively in *R. listeri* and its relative of the Garo Hills. *R. edwardsi* is also rather less opisthodont than *R. listeri*, its index about 63°—65° as compared with 53°.55°.

The difference in colour from true *listeri*, is well marked in all the six Garo specimens, but two of the same group from the Naga Hills presented by Mr. J. P. Mills are somewhat intermediate in tone.

A NEW ARABIAN HARE.

BY

OLDFIELD THOMAS, F.R.S.

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During a recent collecting trip made by Major R. E. Cheesman round the Persian Gulf, he obtained on the mainland opposite the island of Bahrein, a small hare allied to the little *Lepus omanensis* of Muscat, but very differently coloured. Since there are no important skull differences I propose to refer it to that species, of which it would seem to represent a desert subspecies.

In recognition of the pains taken by Major Cheesman to secure mammals in this inhospitable part of the world, I would name it

Lepus omanensis cheesmani, subsp. n.

Size and general proportions as in true *omanensis*. Fur similarly short, the hairs on the back about 15 mm. in length. General colour light desert colour, pinkish buff instead of the dark drab of *omanensis*. Undersurface pure white, that of *omanensis* dull buffy, though the specimens of the latter may have been discoloured. Crown like back, pinkish buff. Area round eye, reaching back towards the ears, whitish, contrasting prominently with the buffy crown. Proectote of ear pale buffy without blackened tips, the tips being quite black in *omanensis*; inner fringe buffy whitish; metentote dull buffy, its edges whitish. Nape patch "warm buff." Hands and feet buffy whitish, the palm and sole brushes soiled drabby. Tail white, the proximal part of the upper surface black.

"Eye golden yellow" R. E. C.

Skull as in *omanensis*.

Dimensions of the type:—

Head and body, 380mm.; tail 54mm.; hindfoot 84mm.; ear 94mm.; Skull, greatest length 70·5mm.; condylo-incisive length 63mm.; zygomatic breadth 34mm.; nasals, oblique length 26·5mm.; interorbital breadth on supraorbital wings 21mm.; intertemporal breadth 10·2mm.; palatal foramina 18·2mm. by 7·7mm.; breadth of palatal bridge 4·4mm.; tooth row (alveoli) 8·2mm.

Hab.—Arabia on western shore of Persian Gulf. Type from Dohat al Salwa, mainland coast to south of Bahrein Island.

Type.—Adult male. B.M. No. 21.6.23.1. Original number 616 of the Cox-Cheesman Collection. Killed 31st March 1921. Presented.

This desert hare is readily distinguishable from *omanensis* by its much paler colour, white rimmed eyes, concolor ears, paler nape patch and white belly. It will probably be found to be widely distributed over the sandy parts of Eastern Arabia, while true *omanensis* is likely to be restricted to the neighbourhood of Muscat, where different colour conditions would prevail.

Major Cheesman gives the following note on the capture of the hare, "From Ojair to Salwa hares were most plentiful; we saw six and one of the men shot one with his rifle—some shot—We tried for the others, but they were always gone too far before you could get your gun out of the saddle bag,—and shooting from a moving camel is not easy."

NOTES ON INDIAN BUTTERFLIES.

BY

LIEUT.-COLONEL W. H. EVANS, D.S.O., R.E., F.Z.S., F.E.S.

(*Continued from Vol. XXVII, page* 93.)

29. Bethune Baker in T. E. S. 1918 has issued a revision of the genus *Tarucus* based on the genitalia. He finds that not only are most of the *theophrastus* like forms described by Moore and Butler good species, but that certain additional species exist in India. The following are confirmed as species : *theophrastus*, F.; *nara*, Koll.; *venosus*, M.; *callinara*, But.; *extricatus*, But.; *alteratus*, M. The following are described as new : *callinara nigra* from Karachi, Cutch and Campbellpore ; *bengalensis* described from an unique male from Calcutta and said to be very like the author's *mediterraneæ* from Palestine and Algeria. *ananda*, DeN., hitherto placed in *Castalius*, is removed to *Tarucus* and a new species *dharta*, is described from a pair from Darjeeling, as differing from *ananda* in being smaller, markings more separated below, female with a good deal of blue above and not all brown as *ananda*. *plinius*, F., is now-a-days considered to belong to the genus *Syntarucus*.

Mr. Bethune Baker states that his studies have caused him to reconsider his previous conclusions as to what constitutes a species ; he does not, however, enlarge on this point. I personally think that, as far as the Indian region is concerned, we have only one *theophrastus* like species, but that it is exceedingly susceptible to local influences and that any change in the facies may be correlated with a change in the genitalia. I have no doubt that if someone studied *Terias hecabe*, he could prove to his own satisfaction that the name comprised numerous species. Even Colonel Swinhoe, who is our great exponent of the theory that every variety should rank as a species, fights shy now and then of the school that rely solely on genitalia examinations—*e.g.*, his treatment of the genus *Tapena* in Lepidoptera Indica. The whole question is very intricate and, as an amateur, I am diffident about writing on the subject at all. My own studies have tended to prove that members of the same species from widely separated localities always show differences in their genitalia ; whether such differences would constitute a bar to free interbreeding, it is impossible to say off hand and practically impossible ever to prove ; to me it seems best to treat such differences as racial rather than as specific, though after the lapse of time their specific value may become established. *T. theophrastus*, however, presents a somewhat different problem ; here we have, according to Bethune Baker, a number of different species flourishing in the same area. I have caught the species commonly at Jabalpur and Rawalpindi and more rarely at several other places. I quite understand that the specimens caught in different localities or obtained in the same locality at different seasons are likely to differ and I know that they do differ, but I do not believe that on the same day and in the same place I could capture more than one *theophrastus* like species. I have caught a *venosus* form concurrently with a *nara* form, but no one will persuade me that they were more than ordinary varieties. If, however, two series caught at the same season and in the same locality were shown to differ materially in the genitalia, I might be inclined to reconsider my opinion ; I say "might" advisedly, since other factors have to be taken into consideration, *e.g.*, a brood produced from a food plant other than the normal one might produce an incipient species, which under natural conditions would soon be swamped by the prevailing form. I remember at Jabalpur one day catching a number of dwarf *Tarucus plinius* along with the normal form; I will not venture to say how they were produced, but it never occurred to me that

the dwarfs were anything more than casual varieties. The results of local influences are peculiarly noticeable in the genus *Parnassius* and numerous races have recently been named; the problem is where to stop, I am quite sure that if Mr. Bethune Baker were to employ a large gang of collectors hunting all over India for *T. theophrastus*, he would more than double his list of species in a very short time.

30. Fruhstorfer in Tijd voor Ent, 1918 gives us a revision of the genera *Castalius* and *Heliophorus* (=*Ilerda*), based on the genitalia, together with other notes. He puts *Taraka* next *Castalius*, a change that is not justified by the habits; *hamada* is confined to Japan and Formosa, the Indian race being christened *mendesia*. *Orthomiella* is sunk *to Una*, a rather strange proposition, while *rovorea* is described from the Chin Hills as a race of the Sikkim *pontis*. In *Castalius*, the species *ananda* is included; *approximatus*, But., is given as the Burmese race of the Indian *rosimon*; *roxana* as the Indian race of the Javan *roxus*, *manluena* being the Nicobar one; *elna noliteia* is named as the *elna* race from India and Burma; *decidia* is placed as the Indo-Burmese race of the Celebesian *caleta*, Hew., the Ceylon race being *hamatus*, M.; the Andaman forms of *elna* and *roxus* are placed as unnamed races.

Heliophorus indicus, Fruh, is given as the race of the Javan *epicles* flying from Sikkim to North Burma; as a matter of fact *epicles* occurs as far South as the Karen Hills in Burma and also in the Middle Andaman. *Birmana* is given as a new race of the W. China *saphir* Blanch, as from Upper Burma. *Androcles androcles* (=*viridis*, mihi) is given from the E. Himalayas and *androcles coruscans*, M., from the W. Himalayas; Fruhstorfer is no doubt right in assuming that Doubleday's types came from the E. Himalayas.

31. Fruhstorfer in Leiden Zool. Med. 1916 deals with the genera *Lycœnesthes and Nacaduba*, basing his results on genitalia examination.

andamanicus is named as the race of the Indian *emolus*. *lycœnina* is confined to Ceylon and *lycambes*, Hew., given as the N. Indian race; he does not tell us what we are to call specimens of this species from S. India and Burma.

In *Nacaduba* several important changes are made and I append a list of the Indian species and races.

pavana, Hors., Java, with races; *nabo*, Fr., India and ? Andamans; *vajana*, Fr., Siam and Burma; Ceylon not mentioned.

augusta, Druce, Borneo, race *kerriana*, Dist. Tenasserim.

pactolus, Fd., Amboina, with races; *ceylonica*, Fruh., Ceylon; race unnamed S. India; *continentalis*, Fruh., Sikkim to Burma; *andamanica*, Fruh., Andamans; *macropthalma*, Fd. Nicobars.

nora, Fd., S. Moluccas with race *noreia*, Fd. Indian region.

aluta, Druce, Borneo, race *coelestis*, DeN., N. India and N. Burma; unnamed race, Andamans.

dana and *hampsoni*, DeN., Indian region.

viola, M. Sikkim to Burma and Andamans; race *merguiana*, Fruh, Mergui, *ancyra*, Fd., Assam to Burma and Nicobars.

berenice, H. S. locality not clear but presumably Malayan, with races; *ceylonica*, Fruh, Ceylon; *plumbeomicans*, W. M., Andamans and India; *aphya*, Fruh, Siam and Rangoon, *nicobaricus*, W. M. Nicobars.

atrata, Hors, Java with race *gythrion*, Fruh, Indian region (Lep. Ind. Plate, 658 (3 to 3a.)

perusia, Fd., S. Moluccas with races; *prominens*, M., Ceylon (Lep. Ind. plate 658 3 c. to 3d.); *euplea*, Fruh, India and Burma.

The difference between *atrata* and *prominens* would seem to need further investigation. I have personally no doubt of the specific distinctness of the tailed and tailless forms of what DeNicéville treated under the name *ardates*. In J. B. N. H. S. 1910 I described the tailless female from Sikkim with a yellow underside as *sivoka*. Swinhoe in Lep. Ind. calls the tailless and tailed forms

nora and *noreia* respectively and I think they might stand as *nora sivoka* and *noreia*. I am not quite clear what Fruhstorfer's intentions are in respect of *bhutea*, DeN., but I imagine he wishes to unite it to *noreia ; bhutea* is in my opinion a perfectly good species, of which I described the Palni Hills race as *kodi* in J. B. N. H. S., 1910.

32. Reverdin in Etudes Ent. Comp, 12, issues a revision of the genus *Hesperia* (palearctic), based on the male genitalia. Chapman in Ent. Rec. 1917-1919 reviews Reverdin's results and gives his own. Amateurs, who are interested in the study of genitalia, should read Dr. Chapman's introductory remarks. Mr. Pierce's works on the genitalia of the British *Noctuidæ* and *Geometridae* are no doubt excellent, while Mr. Bethune Baker's writings and photographs are full of interest, but nothing I have read has been so clear and simple as Dr. Chapman's short exposition referred to above.

33. Mr. E. J. Godfrey in J. N. H. S. Siam 1916 gives an interesting list of the butterflies of Siam and describes a few new races and species of which the most interesting is a new *Everes*, viz., *rileyi* ; said to be like *dipora* above and *parrhasius* below ; Bangkok, Siam ; it is the only *Everes* recorded from Siam.

34. Hampson in N. Z. XXV, issues a list of families and sub-families of the order Lepidoptera. The Rhopalocera come thus between No. 37. Castniidæ and No. 44. Euschemoniidæ.

38. Danaidæ. (for Nymphalidæ).
Euplœinæ. (for Danainæ).
Maniolinæ. (for Satyrinæ).
Æginæ. (for Morphinæ).
Acræinæ.
Danainæ. (for Nymphalinæ).
39. Asciadæ. (for Pieridæ).
40. Cupidinidæ. (for Lycænidæ).
41. Plebejidæ. (for Nemeobidæ).
Plebejinæ. (for Nemeobinæ).
Libythæinæ.
42. Equitidæ. (for Papilionidæ).
43. Erynnidæ. (for Hesperiidæ).

I suppose some useful purpose is served by this kind of thing but nothing annoys the amateur student so much as apparently useless changes in nomenclature. It is a great pity that we have no international authority empowered to issue an authoritative list of known families, genera and species ; any alterations or additions might be proposed by individuals but should not come into force unless formally approved by the central authority after due discussion in scientific journals. All delving into the records of the past should be vetoed, as far as nomenclature is concerned the result would be that the energies of many excellent naturalists would be diverted to useful progressive work, from what may be termed useless retrogressive work.

35. All entomological students will welcome Mr. T. R. Bell's important contribution towards the classification of the Hesperiidæ in a recent number of the journal. His results are primarily based on the early stages and of this branch of lepidopterous entomology, not only is Mr. Bell a master, but it is a deplorable fact that he is the only real student we have ; a Mr. Bell in Tavoy and another in Assam would very soon put us all straight. I have devoted considerable attention to this family and am acquainted with the habits of the imago of most of the known species. I have also examined the structure and genitalia of many species, but in this latter branch of study Mr. Ormiston of Ceylon leads the way. Mr. Ormiston has published his results as regards the Ceylon Skippers, but I understand he has been studying those from other districts and I hope that in due course he will publish his further results.

I think that there is no doubt that the data in which Mr. Bell relies are far and away the most satisfactory for purposes of classification and that study of the habits as well as what may be termed cabinet investigation are little more than confirmatory ; yet, as Mr. Bell points out, there are many species and even genera whose early stages are entirely unknown and all we have to go on for the present are the habits and the results of examination of the imago. I had already worked out a rough classification of the family and find that my results accord very closely with Mr. Bell's. I give below the points on which we differ.

(*a*) I agree with Swinhoe in putting the Ismeninæ at the head of the family. I quite understand Bell's reasons for putting them after the Hesperiinæ, but they differ more from all the other sub-families than the latter do inter se.

(*b*) Ormiston is of opinion that *Hantana infernus* is the male of *Celænorrhinus spilothyrus* and I am pretty certain that he is right, in which case it would be wrong to put *Hantana* in any sub-family other than the Celænorrhinæ. Again from genitalia examination it is evident that *Achalarus* is a very close ally of *Celœnorrihinus*, while *Capila* and its allies, with their very peculiar, large trifid clasp, are quite separate and might be classed as Capilinæ.

(*c*) Following the Celænorrhinæ, the Hesperiinæ come in naturally but, after the Hesperiinæ I should prefer to see the Pamphilinæ which are decidedly allied to the Hesperiinæ. I should follow thus—Plastingiinæ, Notocryptinæ, Erionotinæ and Erynninæ, wherein I would include the Baorinæ, as the latter group seem barely separable as a sub-family.

(*d*) I am surprised to see *Baracus* near the end of the Erynninæ and would prefer to see it next *Astictopterus*, which with its allies seems to come better into the Pamphilinæ. *Pithauria* (includes *Pithauriopsis*) should come between *Halpe* and *Parnara*, where perhaps *Iton* is also better placed. *Œrane* is probably a near ally of *Notocrypta*, *Hidari* of *Erionota* and *Acerbas* of *Plastingia*.

My arrangement would therefore be as given below and I think it more or less brings together the order followed by Watson, Elwes and Swinhoe with that given by Bell: I cannot, however, persuade myself to adopt al Swinhoe's new genera.

Ismenina.	Ismeninæ.	*Bibasis. Hasora. Ismene. Rhopalocampta. Badamia.*
Hesperiina.	Capilinæ.	*Capila. Crossiura. Orthopœtus. Calliana.*
	Celænorrhinæ.	*Charmion. Achalarus. Hantana. Celœnorrhinus. Coladenia. Gerosis. Sarangesa. Darpa. Tapena. Ctenoptilum. Odontoptilum. Caprona. Satarupa. Tagiades. Odina.*
	Hesperiinæ.	*Gomalia. Carcharodus. Hesperia. Thanaos.*
Pamphilina.	Pamphilinæ.	*Pamphila. Taractrocera. Ampittia. Aeromachus. Ochus. Baracus. Astictopterus. Koruthaialos. Iambrix.*
	Plastingiinæ.	*Suada. Suastus. Pedestes. Arnetta. Sebastonyma. Itys. Isma. Zographetus. Scobura. Sepa. Pirdana. Plastingia. Lotongus. Acerbas. Creteus.*
	Notocryptinæ.	*Hyarotis. Udaspes. Notocrypta. Oerane. Sancus. Kerana. Watsoniella. Tacupa.*
	Erionotinæ.	*Hidari. Erionota. Pudicitia. Gangara. Paduka. Matapa.*
	Erynninæ.	*Cupitha. Erynnis. Augiades. Telicota. Actinor. Halpe. Onryza. Pithauria. Iton. Parnara. Gegenes. Eogenes.*

36. A note on the sub-family Poritiinæ.

I have recently returned from a 5 months collecting tour in Burma and was fortunate enough to obtain some 200 specimens appertaining to 10 different species of the genera *Poritia, Simiskina* and *Zarona*. The literature dealing with this sub family is most confusing and I hope that this note will clear up most of the doubtful points and that the keys will enable collectors to identify their captures more easily than heretofore.

I will take in turn the species of *Poritia* that have been described from India or the Malay Peninsula.

(*a*) *sumatræ*, Fd, is a very distinct species about which there is no confusion. I personally did not meet with it, but Bingham recorded it from the extreme South of Tenasserim. Distant's figure in Rhop. Mal. of *sumatræ* ♀ var is undoubtedly referable to *geta*.

(*b*) *hewitsoni*, M., is a well known species. Doherty (J. A. S. B. 1889) described some specimens he caught at Myitta, Tavoy, as *hewitsoni* var. *tavoyana*, but, as he seems to have mixed up this species with *geta, erycinoides, pleurata* and possibly others, it is difficult to say what *tavoyana* is referable to. There is however no doubt that Burmese specimens of *hewitsoni* differ from Indian ones in the reduction of the blue spotting of the apical area of the forewing and *tavoyana*, might stand as the Burmese race of *hewitsoni*. I only met with this species rarely on the East side of the Dawna range. It is probably commoner in Upper Burma.

(*c*) *pleurata*, Hew, Singapore. The description mentions 2 blue spots on the black apex of the male, which are missing in the plate. De Niceville, Elwes and Bingham have all identified *geta* as this species, but Swinhoe very correctly pointed out the error in Lep. Ind. At the foot of the Dawnas on the East side I caught 14 males and 3 females of a species I am naming *dawna*; it is nearer Hewitson's figures of *pleurata* than is *geta*, but there are certain pronounced differences. It is possible that *dawna* may turn out to be the Burmese race of the Singapore *pleurata*.

(*d*) *geta*, Faw., Toungoo. This species is well figured by Swinhoe in Lep. Ind. and the female by DeNiceville in his Vol. III, under the name *pleurata*. I found it common in the Karen Hills and the Dawnas, rather rare in Tavoy and Mergui. Specimens from Mergui (King Island) have the blue apical markings reduced and I propose to call them race *regia*. The spring form of *geta* in the Karen Hill is larger and greener than the autumn form.

erycinoides, Fd., was described from a male from Java and *phraatica*, Hew., from a female from Singapore. I feel convinced that, as pointed out by DeNiceville in J. A. S. B. 1895, these names represent the male and female of the same species. Distant in Rhop. Mal. described and figured a male to fit Hewitson's female; I think his male probably=*pleurata*. Bingham in the Fauna and Swinhoe in Lep. Ind. followed Distant but confessed they had never seen a male *phraatica*. Bingham seemed to think that *erycinoides* was merely a blue variety of *hewitsoni*; he assigned to it a *hewitosni* like female and said he had only seen 3 males and 2 females. Swinhoe in Lep. Ind. says that Bingham is entirely wrong about *erycinoides*; he claims to have specimens from Mergui and says that Druce has it from Sikkim; he figures a male, which he says resembles Felder's type exactly and he gives it a female, which differs but slightly from Hewitson's figure of *phraatica*. Now I found a (blue not greenish blue as in the rest of the genus) male, matched by a female with yellow discal areas, to be very common in Tavoy and not uncommon in

the Karen Hills, the Dawnas and Mergui; on several occasions males and females were taken in coitu. The male agrees fairly well with Felder's figures of *erycinoides* and the female with Hewitson's figure of *phraatica*, but both sexes were extremely variable. In De Niceville's collection there is a series of this species from Burma, the Malay Peninsular, Sumatra and Java. Javan specimens differ from the remainder in the much greater extent of the blue areas and resemble exactly Swinhoe's figure of male *erycinoides* in Lep. Ind. Felder's figure curiously enough resembles the continental form more than the Javan. Fruhstorfer (B. E. Z. 1911) confines *erycinoides* to Java and puts *phraatica* as the continental race : this is very likely the correct course.

(*f*) In the Karen Hills in November I obtained a species of *Poritia*, which is not referable to any known species and which I propose to call *karennia*. The male is not unlike *hewitsoni*, but the yellow female is very different, while the underside in both sexes is strikingly different to that of any other member of the genus. I personally only caught 2 males and a single female, but there are other males in Mr. W. Archbald's collection caught both in the spring and the autumn and there are 2 males in DeNiceville's collection over the label *pleurata*, which is the dumping ground for all *hewitsoni* like species from Burma. Elwes in P. Z. S. 1892 mentions that Doherty obtained in the Karen Hills 2 yellow females, which he suggests may be dimorphic females of *pleurata* (recte *geta*), but I think they were probably females of *phraatica*.

I will now turn to the genus *Simiskina*, which differs slightly from *Poritia* in the secondary sexual characters of the male and very markedly on the underside, which does not have the crowded catenulated bands common to every *Poritia*.

(*g*) *phalena*, Hew. (=*harterti*, Doh.) presents no difficulty. I caught one pair in the Tavoy district and DeNiceville has a few specimens from Katha. Fruhstorfer puts *harterti* as the Assam race in spite of Hartert's own assertion that his unique specimens from the Patkoi Hills differed in no way from specimens he caught in Sumatra.

(*h*) *pediada*, Hew., presents no difficulty. I caught several males and females in the Tavoy district.

(*i*) *phalia*, Hew., male, Borneo ; *potina*, Hew., female, Singapore: *fulgens* District Malay Peninsular were, I think rightly united by Bingham under the name *phalia*, but he figured a variety of the female which led Fruhstorfer (B. E. Z. 1911) to call the Burmese race of *phalia* (=*potina* and *fulgens*) *binghami*. Swinhoe in Lep. Ind. treats *phalia* and *potina* (=*fulgens*) as distinct species ; having never seen a male *potina*, he copies Doherty's figure (J. A. S. B. 1889), while for *phalia* he figures a male from Burma, which differs very slightly from his figures of male *potina*, and he allots to it a purple female from Labuan. Now I obtained several males and females of what I call *phalia* in the Dawnas, Tavoy and Mergui. Except for one Dawna specimen the males are pretty constant and resemble Hewitson's and Doherty's figures. Females were very variable and every gradation was obtained from Bingham's figure with no black shading on the upperside of the forewing along the dorsum, to Hewitson's figure with an entirely black inner margin. The aberrant Dawna male is not unlike Swinhoe's figure of *phalia*, but the blue markings are more extended, the discal and sub-marginal spots being completely joined in space 1 forewing and in 1 to 4 hindwing, while the streak in 1-a forewing extends to the base ; the blue

colouring is pure blue with no hint at green as is the case with all normal males; at present I intend to treat it as a variety of *phalia*. What Swinhoe's purple female from Labuan is I cannot say, but it does not concern us in India at present.

There are two other members of the genus *Simiskina* that may turn up in Burma, *viz.*—*pheretia*, Hew., Singapore; male below rather as *phalena*, but above the hindwing is mostly pale blue; female brown above with the termen or the hindwing broadly pure white; *pharyge*, Hew., Borneo, Malay Peninsular and Renong, Siam; not unlike *pediada*, but easily recognised by the presence of a bright blue submarginal line on the hindwing below.

On two occasions a male and a female of *Zarona jasoda* were caught in coitu, which puts an end to the doubt that has always existed, as to whether *jasoda* and *zanella* were different species. A few specimens of both sexes were obtained in the Dawnas, Tavoy and Mergui. Fruhstorfer has sunk *Zarona* to *Deramas* and calls *jasoda* a race of the Malayan *livens;* the only difference between the two is the secondary sexual characters; Distant asserted that they were present in *livens* and there are certainly none in *jasoda*. I have not seen *livens*, but I can quite believe that Fruhstorfer is right and *jasoda* may well be a race of *livens*, that has lost its secondary sexual characters.

Cyaniroides libna was not met with.

Key to *Poritia*.

Note.—All males are very similar and are brilliant blue or green above with a broad black apex to the forewing, which, when the spotting is fully developed, bears sub-marginal blue spots in 2 and 3 joining, a diagonal series beyond the end of the cell leading to the costa. The presence or absence of a black spot of varying size about the middle of vein 1 upf. and of marginal spots uph. are variable individual and not specific characters.

1-a. (6). ♂ uph. blue colour extends above vein 4 into space 4, at least near the margin.

1-b. (4-a). ♂ upf. cell entirely black.

1. (2-a). ♂ upf. blue colour not above vein 2; green rather than blue; apical area f. unmarked. Uph. lower part cell and all 4 blue. ♀ purple with a black apex bearing two rows of purple spots, the outer spots being separated by ochereous lines. Below the catenulated bands are even, continuous and parallel to one another, not discontinuous and irregular as in the rest of the genus.

sumatræ, Fd. Extreme South of Tenasserim. (Bingham).

2-a. (1). ♂ Upf. blue colour extends into 2 and often into base of 3.

2. (3) ♂ uph. cell and basal part of 4 blue; blue rather than green; apex unmarked except for marginal spots in 2 and 3. ♀ yellow, costa, termen and outer third of dorsum f. dark brown, width ·1 inch; h. entirely yellow except that the costa is whitcish, the base has some dusky brown shading and there is a row of dark brown sub-marginal spots. Below white, catenulated bands as usual, but differs conspicuously from the rest of the genus in that on the upper part of the disc f. and near the apices f. and h. there are prominent large bright brown burnt sienna patches.

karennia, nov. Karen Hills, 3,000 feet.

3. (2). ♂ uph. lower part of cell and all 4 blue, with a dark streak at end cell; green rather than blue. ♀ upf. pale purple blue in 1a, 1 and centre of 2 with an orange patch in 3, sometimes extending into 2; cell black and apical spotting as in the ♂ but better developed; uph. black except for a rather small blue discal patch. Below smoky grey to pale cinnamon.

A. upf. apical spotting well developed in both sexes.

hewitsoni hewitsoni, M., Kumaon to Assam.

B. Ditto much reduced and sub-marginal spots absent.

hewitsoni tavoyana, Doh., Burma.

4-a. (1-b). ♂ upf. cell all blue.

4. (5). ♂ uph. lower part cell and all space 4 blue; green rather than blue. ♀ pale blue obscurely shot with violet, black areas as in ♂ but apical spotting more developed; uph. sub-marginal dark spots prominent. Below pale cinnamon, but sometimes smoky grey in ♂.

A. Apical spotting well developed, especially spots beyond cell in ♀. In ♂ blue colour always extends into 3 upf.

geta geta, Faw., North Burma to Tavoy.

B. Apical spotting much reduced, ♂ spotless and ♀ only with sub-marginal spots in 2 and 3. In ♂ blue colour does not extend into 3 upf.

geta regia, nov. Mergui.

5. (4). ♂ uph. lower part cell and basal half space 4 black; blue rather than green; upf. the lower edge of the cell is narrowly black from the middle to the outer end and the blue colour extends into 3, apex only obscurely spotted; uph. marginal spots and sub-marginal dark fascia better developed than usual. ♀ rather pale blue with a green tinge, when looked at sideways; extent of blue area and spotting as in male, but latter much more developed; upf. base dusky, leaving a prominent blue spot in middle of cell; uph. costal margin dusky and there is sometimes a blue spot in 5 near the margin. Below creamy white, catenulated bands rather faint.

dawna, nov. Eastern Dawnas, 1000 feet.

6. (1-*a*). ♂ uph. cell and whole of space 4 black; rich royal blue with no tinge of green, thus presenting an entirely different appearance to the rest of the genus; upf. a narrow blue streak inside the cell from the extreme base of the lower edge to the middle; the spotting on the black apex is usually very well developed (in the Javan race the apical and the discal blue areas merge) but specimens occur, which are entirely black on both wings except for a few blue spots. ♀ above dark brown with an orange yellow discal patch upf. and a discal fascia uph of very variable extent, also uph. some more or less obscure orange sub-marginal patches and an ochreous sub-terminal line. Below ♂ smoky grey; ♀ creamy white.

erycinoides phraatica, Hew., Burma.

Key to *Simiskina*.

Note.—Males are very alike above, but the pattern is quite different to *Poritia*; black with brilliant blue or green markings. Upf. a streak from vein 1 to vein 4 along and below the median vein, outwardly irregular and produced outwards in space 2; 2 or 3 spots beyond the end of the cell and a complete sub-marginal series curved inwards at the upper end; a short diagonal streak in the middle of 1-a with a small spot above its outer end in 1. Uph. a streak in 1 from the base to the disc and discal spots above its lower end in 2 and 3; sub-marginal spots in 1, 2 and 3, the former being the largest and sometimes conjoined to the streak in 1; costa broadly pale brown. Below there is a dark line at the end of the cell on both wings, a curved discal and a similar post discal line.

1. (2-*a*). Below a white band across both wings in both sexes. ♂ above markings brilliant green. ♀ above brown with a prominent white discal spot upf.

phalena, Hew. Assam to Burma.

2-a. (1) Below no white band.

2. (3). ♂ above markings brilliant green; Unf. apex only slightly if at all paler. ♀ uniform dark brown above.

pediada, Hew., South Burma.

3. (2). ♂ above markings brilliant blue, sometimes tinged with green: unf. apex conspicuously paler than the rest of the wings. ♀ orange yellow; upf. apex and termen dark brown and sometimes with dark brown shading of varying

width and intensity along the dorsum and a thin line at the end of the cell; uph. entirely orange yellow, sometimes suffused with brown scales at the base and on the side disc and forming brown sub-marginal spots.

phalia, Hew. South Burma.

37. I have to note the following additions to the Indian List.

(*a*) *Cirrochroa orissa*, Fd., Malay Peninsula, Sumatra and Borneo. Discovered by Messrs. O. C. Ollenbach and W. A. Wood in Tavoy. Caught by me on King Island, Mergui, in December. It differs from all other members of the genus in having a very broad pale yellow band across the forewing.

(*b*) *Papilio varuna*, White, Malay Peninsula. Two females caught by me on King Island, Mergui, in December. It differs from the race *astorion*, Wd., in that the female has a very large white patch on the lower part of the disc upperside forewing.

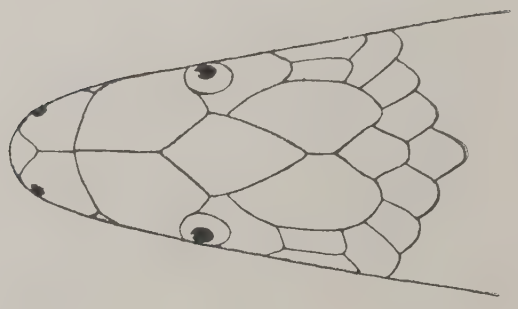
(*c*) *Arhopala ormistoni*, Riley. The Entomologist, May 1920. This is a new species obtained by Mr. W. A. Ormiston at Nakiadenya near Galle in April. It is said to be nearest to *alitœus* and *mirabella*.

(*d*) *Mantoides licinius*, Druce, Borneo. Discovered by Messrs. Ollenbach and Wood on a hill at Pagaiye in Tavoy and a pair obtained by me on the same spot in December. In general appearance and size like *Cheritra freja*, but the long tail is at vein 1 and the short tail at vein 2, not the other way about as in *freja*; also the white area at the anal angle is greater. Below the general tone is pale yellow brown except along the dorsums of both wings, where it is white. The male has pronounced secondary sexual characters, *viz.*, a large polished area on the disc of the hindwing upper hind and a pouch at the end of space 6; on the underside of the forewing there is a prominent upturned tuft of hairs from the middle of the dorsum, which is highly convex, nearly to vein 2 and overlying a dull lead grey patch, denuded of scales.

(*e*) *Jacoona anasuja*, Fd., Malay Peninsula. Obtained by Messrs. Ollenbach and Wood and subsequently by me at the same place and month as *Montoides licinius*, to which group it belongs, as regards shape and tails, but the male has no secondary sexual characters. It is a much larger insect, being 2 inches in expanse and the male is very magnificent above, being dark brown with a brilliant dark blue area at the base and a similar pre-apical patch on the forewing, a blue streak on the hindwing from the base to near the centre of the termen and there is the usual anal white patch. The female is without the blue areas. The long tail is 1 inch in length and the short tail a quarter of an inch. Below it is white, the forewing being for the most part pale yellow brown, shading to bright ferruginous at the termen and the apex.

(*f*) *Biduanda nicevillei*, Doh, female. I obtained a few males of this very distinct species at Kanbauk and Pagaiye, Tavoy, and a single female at Pagaiye, in December. It is very similar to the female of the commoner *Biduanda melisa*, M.; above there is the same blueish white patch at the anal angle of the hindwing but on the forewing there is a large red discal patch. Below the two species are very alike differing constantly as follows. On the forewing of *melisa* there is white patch on the dark discal area beyond the cell, below which there is an irregular and more or less double dark streak to vein 1; on the hindwing the inner of the two dark lines at the end of the cell is much thicker and partly coalesced to the outer line. On the forewing of *nicevillei* there is a very narrow white line on the dark area beyond the cell, below which there is

A



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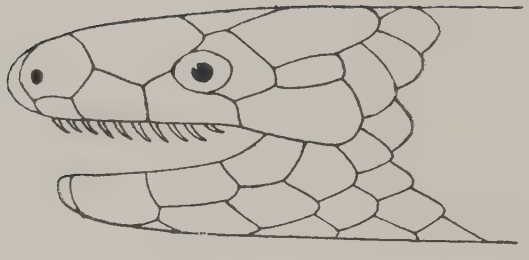

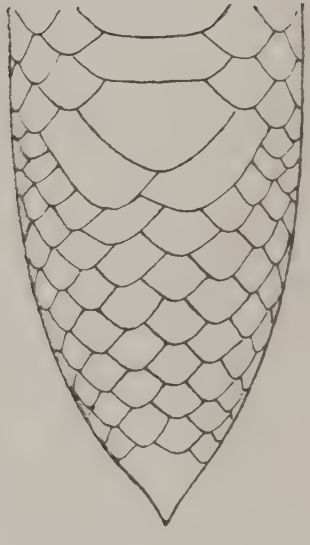

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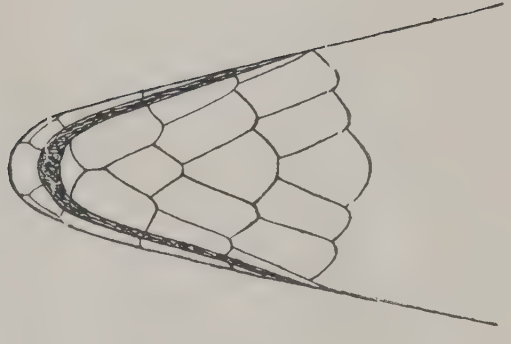
C



A.—Upper surface of head.
B.—Side view of head.
C.—Under surface of head.
D.—Under surface of tail.

BRACHYOPHIDIUM RHODOGASTER.

(Enlarged about 6 times.)

A NEW SNAKE OF THE FAMILY *UROPELTIDAE*.

BY

COLONEL F. WALL, I.M.S., C.M.G., C.M.Z.S.

(*With a plate.*)

Among a small collection of snakes in St. Joseph's College, Bangalore, I discovered a small Uropelt which is not only a species new to science, but constitutes a very well marked genus, combining the characters of *Plectrurus, Pseudoplectrurus, and Platyplectrurus.*

BRACHYOPHIDIUM, gen. nov.

General characters.—Body short, of considerably greater calibre posteriorly than anteriorly, cylindrical, smooth. Head small. Snout narrowly rounded. Eye in an ocular shield. No mental groove. Neck not constricted. Tail short, strongly and increasingly more compressed from base to apex.

Lepidosis. Nasals.—Meeting behind the rostral. *Internasals.*—Absent. *Præfrontals.*—A pair. *Supraoculars.*—Absent. *Præocular.*—Absent. *Ocular.*—Present. *Postocular.*—Absent. *Temporal.*—Present. *Supralabials.*—Four. *Infralabials.*—Four. *Sublinguals.*—Absent.—*Costals.* In 13 rows anteriorly, in 15 rows at midbody to vent. Smooth. Last row enlarged ; about three-fourths the breadth of the ventrals. *Supracaudals.*—Smooth. *Terminal Shield*—Small, compressed, ending as a single point.

Ventrals.—Moderately developed. *Anal.*—Divided, about twice the breadth of the last ventral. *Subcaudals.*—In pairs.

BRACHYOPHIDIUM RHODOGASTER, spec. nov.

General characters.—Snout narrowly rounded. Nostril in the anterior part of the nasal. Eye more than half the length of the ocular.

Lepidosis.—*Rostral.*—Deeper than broad, portion visible above equal to the suture between the nasals. *Nasals.*—Large, in contact behind the rostral. *Præfrontals.*—Long, nearly as long as the frontal, in contact with the nasal, 2nd and 3rd supralabials, and ocular. *Frontal.*—As long as the snout, much longer than broad, equal to the parietals ; the ocular sutures about one third the parietal sutures. *Temporal.*—One ; shorter than the ocular, about half the parietals. *Supralabials.*—Four, fourth longest. *Infralabials.*—Three, the first in contact behind the mental. *Costals.*—Two head-lengths behind the head 13, midbody 15, two head-lengths before the vent 15. The 4th row divides about four and a half head-lengths behind the head. *Ventrals.*—143. *Anal.* Divided. *Subcaudals.* 7 pairs.

Length.—178 mm. (7 inches).

Dentition.—The maxilla has 10 ? teeth.

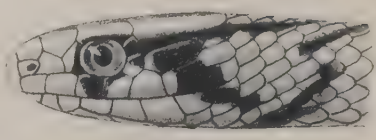
Colour.—Head blackish-brown above. Body dorsally uniform blackish-brown. An ill-defined and rather obscure pale spot on the neck behind each parietal shield. Ventrally roseate from chin to vent, including the ultimate row of costals. A median pink subcaudal stripe.

The specimen is a gravid female, and contained three eggs about 12 mm. long.

It is unfortunate that there is no record of the date of capture or the locality where found. However I found specimens of *Platyplectrurus trilineatus*, *Silybura pulneyensis*, and *S. nigra* in the collection, and as it is known that specimens were received from Shembaganur everything points to its coming from the Palnai Hills.

My thanks are due to Father Accouturier for allowing me to present the specimen to the British Museum.

The accompanying figure shows the detail of the lepidosis but the specimen is rather shrivelled, and the eye may not be quite accurate.



H. Green, del.

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COLUBER LEONARDI
Sp. n. × 2

NOTES ON SOME NOTABLE ADDITIONS TO THE BOMBAY NATURAL HISTORY SOCIETY'S SNAKE COLLECTION.

BY

COL. F. WALL, I.M.S., C.M.G., C.M.Z.S.

(*With a plate.*)

Our Society is indebted to Mr. P. R. M. Leonard for some valuable snakes collected at Sinlum Kaba, Burma, Lat. 24″ Long, 97° at an elevation of 6,000 feet :—These include the following :—

Typhlops diardi Schlegel.

One typical mature specimen.

Cylindrophis rufus (Laurenti).

One halfgrown ♀ ? Ventrals 202. Subcaudals 5 on the right, 6 on the left side ; the 2nd and 3rd entire.

Tropidonotus parallelus Boulenger.

An immature specimen 289 mm. (11⅜ inches) long. Ventrals 160. Subcaudals 83. Maxillary teeth 22 ? Syncranterian, coryphodont.

Amphiesma himalayana (Gunther).

Two small specimens, one 292 mm. (11½ inches) and the other 222 mm. (8¾ inches). Both quite typical.

Trirhinopholis nuchalis Boulenger.

One specimen 298 mm. (11¾ inches) long. The tail 28 mm. (1⅛ inches). Costals 15 in the whole body length. Ventrals 126. Anal entire. Subcaudals 21, the 2nd to 7th entire. The loreal is absent. (Possibly confluent with the posterior nasal ?) Labials 5, the 3rd only touching the eye. (The 3rd is long and appears to be a confluence of the normal 3rd and 4th.) The nostril is placed equally in both nasals, and occupies the upper three-fourths of the suture, so that the generic name is not at all appropriate. Light brown above, most scales finely bordered with black, thus producing a reticulate pattern. The belly is pale yellow (white ?) with many, scattered, very small blackish spots. The sagittal mark on the nape is conspicuous.

Zaocys nigromarginatus (Blyth).

One fine adult. Ventrals 196. Subcaudals 130.

Coluber leonardi, spec. nov.

Lenght 279 mm. (11 inches). Tail 41 mm. (1⅝ inches). *Costals* two head-lengths behind head 19, midbody 19, two head-lengths before vent 17 ; smooth, with double apical facets. Ventrals 223 ? (damaged). *Anal.* Divided. *Subcaudals* 53, divided. *Rostral.* Touches six shields ; the internaso-rostral sutures longer than the naso-rostral, and naso-labial, half that between the præ-frontals, less than both taken together. *Internasals.* Two ; the suture between them less than one quarter the internaso-præfrontals. *Præfrontals.* Two ; the suture between them subequal to the præfronto-frontals. *Frontal.* Touches six shields, the supraocular sutures rather longest ; length equal to snout, two-thirds the parietals. *Supraoculars.* Equal to the præfrontal and internasal, rather less than the frontal, three-fifths the parietals, rather greater than the anterior temporal. *Nasals.* Touching 1st and 2nd supralabials. Nostril wholly in the anterior shield, and occupying the median two-fourths of the suture. *Loreal.* Absent. *Præocular,* One. *Postoculars.* Two. *Temporals.* 1+2 ; the anterior touching the 5th and 6th supralabials. *Supralabials* 7 ; the 3rd

and 4th touching the eye, 6th longest. *Posterior sublinguals* about three-fourths the anterior; touching the 5th and 6th infralabials. *Infralabials* 6; the 6th about three-fourths the length of the posterior sublinguals, and subequal to the breadth of those shields; in contact with two scales behind. Maxillary teeth about 20 (?) Syncranterian ?, coryphodont.

Dorsally the prevailing tint is a pale brown. The scales are more or less finely black-edged, producing a reticulate effect. The whole back from the nape to the tail-tip is crossed with black-edged, buff bars involving three or four scales in the length of the snake, the intervals involving two or three scales. The bars are dislocated dorso-laterally, and pass to the ventral edges. The belly is buff with squarish, black, lateral, irregularly distributed spots (like some *Oligodon*). The tail is buff beneath, with a few small central blackish spots. The head is buff. A conspicuous well-defined black V, shaped like a tuning-fork, has its base on the nape behind the parietals, its arms extending to the præfrontals. A similar well-defined black postocular streak meets its fellow over the nape. There is a black subocular spot on the 3rd and 4th supralabials, and another similar one on the 6th and 7th passes below the gape. There in a black spot at the meeting of the mental, and 1st infralabials, and another on the confines of the 4th and 5th infralabials.

I associate Mr. Leonard's name with the species, which appears to me very close to *C. porphyraceus* Cantor.

Oligodon herberti Boulenger.

A very fine example of this rare snake, described by Mr. Boulenger in 1905 has been received, the first representative in our collection, and only the third known. It measured 400 mm. (1 foot, $3\frac{3}{4}$ inches). The costals are 13 in the whole body length. Ventrals 208. Anal divided. Subcaudals 38. The absence of internasals is a notable feature of this species, and it would appear that they have been absorbed into the anterior nasals, for these shields extend remarkably on to the top of the snout. The light vertebral stripe in this specimen is regularly constricted bilaterally at intervals, to form a chain of spindle-shaped beads. The maxillary teeth are dubiously 7 in number. These are syncranterian and strongly coryphodont as in other members of the genus. There is an edentulous space anterior to the teeth. Mr. Leonard is to be congratulated on securing so many interesting rarities.

BIG GAME SHOOTING OF KASHMIR AND ADJACENT HILL PROVINCES.

By Lt.-Col. A. E. WARD.

(*With two plates.*)

DEER.

Omitting the chital or spotted deer which is only to be found in His Highness' Game Reserve in the Jammu Province, the Kashmir Stag, the Barking Deer and the little Musk Deer are the only representatives.

The Kashmir Stag—*Cervus cashmirianus.*

His Highness' Game Reserves, called locally Rukhs, and the introduction of Game preservation laws have prevented the total destruction of this grand animal.

At the present time the number of deer is on the increase in the Rukhs ; from these there should be a chance of their spreading into the neighbouring hills. The migration from the Rukhs is handicapped by Game license-holders who in the autumn watch for stags in the immediate vicinity of the closed ground, and in the winter by poachers who are constantly on the look-out.

Now if we remember the difficulties experienced in preserving game at home over a small area, we can imagine what has to be faced in the case of tens of thousand square miles of country. It is useless to imagine that poaching in Kashmir can be stopped.

Leopards take many deer, both stags and hinds. Bears are always on the look out for new born fawns. The Indian martens when hunting in families will pull down fawns of six or eight months of age. The destructive agencies at work prevent any large increase of the Kashmir stag, hence it is doubtful whether there is a larger number than existed say ten years ago.

In the early days of the shooting season it is necessary to visit the birch forests, for the big stags are shy, they have been driven by the flocks of goats into the high mountains and crags and until these flocks come down, the large horns are hard to get. Still grand heads are to be got.

Owing to the kindness of Major Wigram and from perusal of the Rukh records, the present list has been made.

The weight of the horns is really the only true test. A long point on top will often give a false idea of the true size. Again some horns are very thin and good or bad grazing has much to say. In a favourable season horns are heavy, in a dry spring they run smaller.

Index No.	Length of horns.	Girth above brow antler.	Divergency at tips.		Tines.	Sportsman.
			Greatest.	Tip to tip.		
1	51½″	6½″	41½″	21″	6×5	G. C. G. Rogers, 1918.
2	50″	6½″	44″	20″	7×6	Game Department, 1920.
3	48″	6 ″	..	..	5×5	A. E. Ward in Sind Valley.
4	47½″	6″	50″	..	5×5	Etherington Smith, 1910.
5	47⅛″	6¼″	39¼″	22″	6×6	P. B. Vandertye, 1910.

Index No.	Length of horns.	Girth above brow antler.	Divergency at tips.		Tines.	Sportsman.
			Greatest	Tip to tip.		
6	47″	6¾″	46″	29″	6×7	A. E. Ward in Sind Valley.
7	47″	7″	48″	23	6×6	F. L. Edge, 1918.
8	47″	5¾″	45″	28½″	5×4	Major Fardell, 1918.
9	46½″	6¼″	45 ″	19½″	5×5	Sir HariSingh, 1918.
10	46½″	..	..	..	..	Major P. Radclyffe, 1918.
11	46″	6½″	36″	15″	..	Miss Manners Smith, 1917.
12	46″	6″	43″	17½″	..	Genl. Berners, 1920.
13	46″	7″	50″	..	..	Aziz Khan, Liddar.
14	46″	5¾″	42″	12″	6×6	Sir Hari Singh, 1917.
15	46″	6¾″	50″	..	6×6	A. E. Ward, Liddar.
16	46″	6″	39″	16″	..	H. C. Pallant, 1917.
17	46″	6½″	..	..	6×5	Dachgam Rukh, 1918.
18	46″	6½″	..	..	6×6	A. E. Ward, 1912.
19	43½″	7½″	..	..	5×5	A E. Ward, 1912.

The photographs are of two stag heads both under 46, but they are showy specimens.

The Maharaja Kumar of Tikari lately shout two every large heads, the measurements are not just now available.

There is available a long list of horns of 44″ in length, some are grand trophies, they are mostly ten pointers. The last head entered is probably the thickest recorded. Barasingh seldom have heavy short horns; as they pass out of their prime the tendency is for the horns to become thin and irregular.

In the Society's Museum there is a fourteen-point head and its history is as follows: Many years ago it was brought together with a second one for sale to Kotsu in the Liddar. Aziz Khan, who has a 46″ pair of horns (No. 13 in the list), said he had shot both the stags. In those days it was lawful to shoot and sell horns. From Aziz Khan the head passed into Monsieur Henri Dauvergne's possession, and at one time was in the Murree Brewery house at Rawalpindi.

The shooting season extends from September 15th to March 15th but few heads are out of velvet early in September, and some of the bigger animals drop their antlers early in March.

The local Shikari is a necessity; he must know every deer path, every pool which is used for soiling or for drinking at. The rutting stag eats little but bathes and drinks frequently. It may be that a travelling beast is met with, but as a rule it will be necessary to be up early, and wander far before the much longed for call is heard.

THE KASHMIR STAG (*CERVUS CASHMIRIANUS*).

Half a century of wanderings after game gives curious instances of sport, Once or twice wandering stags have come to their fate, on other occasions faulty arrangements have caused the loss of good trophies.

On a cold day in October a stag had been tracked for miles. It was wounded in the leg, at intervals it laid down. Twice it was blundered upon but did not give a chance and at last the tracking had to be given up. About ten o'clock on the same day, the time when deer return to the heights, having drunk in the streams below, the disappointed sportsman was sitting behind a rock when a stag called faintly at intervals. Then the sound increased, and eventually the foot fall could be heard coming nearer and nearer. Through the dense forest a royal head appeared and emerged into the open, and the finest twelve tine stag obtained during many years' shooting was easily killed. On another occasion an old stag came along a foot-path to within ten yards of the rifle which was pointing at it, but to slay it would have been unfair. Both these chances came about under similar circumstances, that is by waiting on a deer path below the cliffs where deer conceal themselves during the day.

One of the finest ten-point heads was shot by mere chance. Late in the evening this stag was driven down hill by a messenger returning to the camp, and crossed the sportsman who was also going back to his tents. It galloped down hill and gave a long but clear shot. Luck was good, and although the dead stag rolled with great velocity down a grassy slope and fell with a thud into the rocky bed of the river below, not the least damage was done to the horns.

Many tales could be told of successful sport, but it is well to relate failures, and the first of these to be told is how a famous fourteen-point stag got off unshot at!

As every one knows, stags fight in the rutting season. Many of these combats take place and as the clash of the horns causes a noise which travels far, it is not uncommon to have a chance of looking on whilst the stags settle their differences.

For three days, the fourteen-pointer had been seen, but not in any place where a stalk was likely to succeed. On the fourth day two stags were fighting not far from the bivouac on a steep slope of grass surrounded by fir trees. The two were busily engaged with their horns locked—one was a strong, heavy-antlered ten-pointer and the other the fourteen-tined animal. For a time the horns were so closely locked, that the big stag could not be recognised. Suddenly the fight was suspended and now came the error of judgment for it was imagined that the fourteen-pointer must win, and if the victor, he would give an easy shot.

The stags stood apart almost at the same level, when suddenly the ten-pointer managed to get a little advantage on the hill slope, and dashed at his adversary hustling him down amongst the trees, and the chance of getting the trophy had vanished. Once only in the same jungles has the big headed beast been seen, and no one can now say what head of horns he carries, probably his prime will soon be over and the horns will be short and thin.

A very disappointing termination of a stalk took place lately. At the time when the 'stalkeress' had reached the game a second stag showed itself and in response to an excited shikari's entreaties of "shoot, shoot" the small stag was shot, for the "lady" had not seen the big one! The Kashmir shikari is an excitable creature, and has to be restrained.

This was the last adventure of the big stag, for he was brought to bag by another gun on the following day, and proved to be a beauty.

Up to the last week in October, the advantage is with the sportsman. The stags are careless, they are in pursuit of the hinds, and it is even practicable to get them to draw near by breaking a dry stick, which they imagine to be the approach of a mate or perhaps a rival. Again some of the shikaris can imitate the roar or call, but this plan however seldom answers. Of course the hinds are on the alert,

whilst a small stag who is hanging about in the outskirts of the herd may give an alarm. Still there is no doubt the rutting season is the easiest time in which to get trophies.

In November the dry leaves cover the ground, the stags have mostly gone back to the upland meadows or to the horse-chestnut forests from whence the flocks and herds of cattle have departed, and the hunter and the hunted are on more even terms. A good pair of antlers obtained in November cause a satisfaction which is superior to that obtained by a similar trophy got from a calling stag.

Tracking in the snow may be undertaken. Some of the heads entered in the list were obtained in mid-winter, but it is however very hard work, far too strenuous for most men who have been for long at an office desk. The stag as long as the snow is not above his legs cares little, and plods steadily up hill, but however deep the snow may be he gallops down in a long succession of bounds.

After a most trying climb lasting for hours, a fine stag was suddenly found resting under an overhanging rock. He was up and galloping down hill at once, but by a fluke he was hit and fell. A big Tibetan dog broke loose and seized the stag, as far as could be seen, by the head or ear. The stag jumped up and rushed on, and as he bounded was missed and a long follow had no result.

The only method of having sport in mid-winter is to build a shed, or live in a village and from such headquarters to take the chance at game seen in a position favourable for a stalk. Now and again the hunter may manage to get along on the surface of the crusted snow which will not carry the heavier animal, but this seems to be taking rather a mean advantage. It is under these conditions that the leopard gets an innings. Sneaking along and concealing itself as only a cat can, it rushes suddenly on its prey. If the deer gets a start it is possible but not likely to escape. Such an escape was once seen from the verandah of a hut in one of the Rukhs, but this was a sight which is witnessed once in a life time.

It is very doubtful whether the call of the Barasingh gives any intimation of the age—Kashmir Shikaris say they can tell. In the deer paddocks near Srinagar stags of all ages have been kept, and beyond that the low moan, generally made when the animal is lying down, comes from an old stag, nothing has been learnt. Three-year old and ten-year stags seem to call alike, and all at times conclude the roar with a long deep whistling noise which almost approaches a squeal. This squeal is often (without the moaning sound) but not invariably, the call of a pricket.

For the habits and description of the Kashmir deer, also for all the rest of the Game animals the reader is requested to wait for the second series of articles on 'Natural History.'

The Barasingh played a curious part in the introduction of trout into the Vale of Kashmir. Many years ago an urgent appeal for this deer was sent from Europe. Some were required for 'Woburn,' some for Loos, and others with the view to improving the Red deer. Mr. Chance came to India on behalf of Mr. Jamrach, he delivered the animals in England and had only one casualty, which occurred in the docks.

The deer presented at Woburn were apparently acceptable, for the Duke of Bedford kindly sent trout to Kashmir on two occasions.

In order to capture full grown stags and hinds it is essentially necessary to choose suitable ground. A well wooded southern slope under a ridge of hills with a pronounced low dip in the range is an ideal place. On the southern slopes of the mountains few trees grow, they are covered with grass.

The herd of deer having been located in the northern woods are slowly driven upwards by a few well trained men during the day time when the breeze blows upwards, in other words the deer are "given the wind." If not hustled too much

THE KASHMIR STAG (*CERVUS CASHMIRIANUS*).

they will work their way to the lower part of the range. When close to the top, the beaters fire a gun or shout, the herd breaks into a gallop, and dashes wildly down the southern side. There in the grass are set long lines of plaited nooses made of sound leather and attached to ropes which are in lengths of about 50 or 60 yards. These ropes are pegged down, but not too strongly. The deer get their feet entangled in the nooses, drag up the pegs, and make off with a line of rope and nooses, but before going far they are pulled up by the bushes, and it is then the fun begins for nets have to be employed. Stags are easier than hinds to net, for as a rule they lower their heads, and the horns get into the meshes, but the hinds use their feet and strike out violently.

Once in the nets, the hard work is over, a collar with ropes on opposite sides is fixed on the neck, and the hinds can be led away. The stags have generally to be picketed on the spot, otherwise they plunge about and knock themselves and their captors out of time. In a day or two the deer will drink water in which parched flour has been mixed. They are easily tamed, and seldom die.

Another way, but a laborious one is to catch the fawns before they can run. First they are fed on goat's milk squeezed from a sponge, then from a baby's bottle, and finally a nanny goat is a foster mother. Most of the deer at Pandrathan paddocks were thus reared. In captivity the Hangul breeds freely.

Barking Deer—*Muntiacus vaginalis.*

The Muntjac or Jungli Bakri has a very wide distribution, hence is well known to many sportsmen long before they come to Kashmir.

This small deer is rarely to be met with in the 'Vale'. One came out in a beat at Achabal, another was found by the State Shikar dogs in a small enclosure which was round some rice stalks in the vicinity of Koolgam. Both these had probably strayed from the Pir-Panjal for the Barking deer is fairly common in the outer ranges.

The horns obtainable in the hills of Jammu and Kashmir are smaller than those of the United Provinces, rarely exceeding five inches, whilst 6″ to 7½″ are recorded from Gharwal and elsewhere.

If a specimen is required, it will most likely have to be got in the Jhelum valley near or below Chakoti, there the Barking deer was plentiful, but now is scarce.

The head when artistically set up is pretty, especially when the neck is slightly curved.

The Musk Deer—*Moschus moschiferous.*

The (Roos) of the Kashmiris—"Kastoora" of the United Provinces is more harried than is any other animal of the forest. Commerce calls for the musk pod and pays highly, hence every winter the shikaris issue out with nets, dogs and guns and kill this deer.

Special laws are supposed to protect the Musk deer, and special license has to be obtained from the Game Preservation Department if the sportsman wishes for a specimen in order to complete a collection.

The male is distinguishable from the female by canine teeth about 2″ long which show very plainly, but remember it may only be shot under the special sanction.

There are many Musk deer in the Rukhs, some are easily shot whilst driving is in progress, but the pursuit of them is not as a rule authorized.

Recollections go back to the days when many Musk deer were to be seen here and there on the Ibex ground, and when a small bore rifle was used to bring them to bag and to the kitchen, for the venison is quite good eating.

Tracking the sharp pointed slot in the snow was interesting, but there the sport ended, for the long hair on the skin is very easily broken and will not stand wear and tear.

(To be continued.)

THE BUTTERFLIES OF MESOPOTAMIA.

By H. D. Peile, F.E.S.

(With a plate*.)

As but little appears to be recorded on the butterflies of Mesopotamia and their habits, the following notes on some 44 species recently taken there, and on some 44 others taken in the adjacent highlands of North West Persia and Kurdistan by members of the Society may be of interest to collectors.

The forms here mentioned include those taken by Major T. D. Broughton, R.E., Captain P. A. Buxton, R.A.M.C., Major F. C. Fraser, I.M.S., Lieut.-Colonel C. H. Watney, I.A., by myself and a few others.

Many of these notes were hastily put together when on Field Service; being now in England I have, through the kind permission of Dr. C. J. Gahan at the British Museum of Natural History, South Kensington, been so fortunate as to have had my collection, most of which has now been set up, gone through by Capt. N. D. Riley who has found a number of forms to be new, including a very interesting new Lycæna whose males are orange-yellow instead of the usual blue. I have also to thank Capt. Riley for permission to quote from his notes on my specimens many of which are now incorporated in the National Collection. Some specimens were at first identified by Lieut.-Col. W. H. Evans, D.S.O., R.E., and by Mr. H. T. G. Watkins whom also I have to thank for notes upon variation, races, etc.

Mesopotamia, situated between the Persian Gulf to the South, the mountains of Armenia and Persia to the North, East and South East, and deserts on the West and South West, may be divided into:—

1. A plain of river-silt with immense stretches of marsh and desert, extending from the Persian Gulf to about 300 feet above sea level, and with the Euphrates, Tigris and Karun winding through it.
2. An upland region of undulating sedimentary plateaux, alternating with ridges of sandstone, conglomerate and gypsum; extending from about 300 feet to a little over 800 feet elevation, and gently rising to meet the foot-hills near the border; the gypsum often standing out conspicuously white in the landscape. In the spring this region is a gorgeous carpet of flowers, among the earliest being small marigolds, patches of a mauve stock; white, blue and several shades of purple anemones. Clumps of a large crimson ranunculus and poppies make a rich mosaic with various yellow and mauve cruciferæ; white and yellow marguerites; blue irises, borage and lupins, and pastures gold with buttercups. Later, sprays of rue, and later still, when all these are long over, a low-growing thistle here makes stretches of yellow upon the plateaux. This thistle, common everywhere, here makes up with the sharpness of its long needle-like spines for the almost complete absence of stinging nettles both here and in the highlands beyond the border: liquorice, a luxuriant jungle in the lower alluvial region, continues as rather a stunted plant up onto the plateaux of the highlands. Tamarisk spreads along the margins and beds of the rivers. There too and in moist hollows umbellifers cover immense areas. The green stems and leaves and white flower-clusters of the latest of these (*Ammi visnaga*, Lam.) stand out conspicuously brilliantly, when almost all else has been dried up and withered by the summer heat. In Macedonia, as remarked by Mr. Mace in the *Entomologist*, the same conditions occur. Flowering mint along the margins of water-channels attracts large numbers of butterflies both in Mesopotamia and in the highlands.

* The plate has not been received in time to be included in this number, and will be issued later.

Beyond the border to the North and North East are steep limestone mountain ranges rising from about 2,000 feet, as at Paitak at the foot of the Takigerra pass in Persia, where in August the satyr *S. parisatis*—settles in scores in the water-worn holes of the limestone cliff, up to plateaux at 5,000 and 6,000 feet, such as the Kerind Valley, with peaks of 8,000 feet on either side, or 11,000 feet as near Kermanshah. At four to five thousand feet stunted and other hill-oaks are found; and one may come across the silk cocoons of some large moth, related to the 'moon moth', attached at about 5 feet from the ground to some thorny bush, about which the crimson and yellow leaves of autumn produce a wonderful effect against the grey-blue of the limestone rocks and boulders of the hill side. Near the streams in the gorges and beautiful clefts through the ranges are walnut, mulberry and other fruit trees, the haunt of the magnificent fritillary, *A. maia*, and of the familiar Purple Hair-streak (*Zephyrus quercus*) of England. In the glades many richly coloured blues are found, such as *Lycæna dama*, and *C. thersamon*, the latter a tailed copper, shot with purple.

Humidity.—This in the lower or alluvial region is fairly high from November to April, and low from June to September, when in the undulating uplands it is very low.

Temperature.—In both regions January is usually the coldest month, and there are frosts at night in the winter. Rarely, as in four days in February of 1920, when the rain was late, there is snow. The mean daily temperature varies from about 40° F. in the cold season to about 90° in the Summer. The maximum reaches to over 130° in the shade in July in the alluvial region and to 120° or more in the higher region in August.

These conditions would account for so called 'Wet' season forms in February and October, and extreme Dry forms met with in June in the uplands whereas in the highlands beyond a comparatively 'Wet' season form is still to be found in July, as instanced by the bath white (*daplidice*) one of the commonest forms in some parts of Mesopotamia.

The butterfly species of Mesopotamia are comparatively few. In the alluvial region such as at Amara they probably do not exceed a dozen in number. But on the uplands of undulating plateaux and "Jebels," as the low hill ridges are called, and on the foothills, some 40 forms occur to my own knowledge.

On these uplands the earliest broods appear towards the end of January, but cold may delay them a month or more, as in 1920; and in the Spring, especially early in May, with the wonderful profusion of flowers there is a corresponding abundance of butterflies, that is of individuals of some half dozen or so species, *P. machaon*, *Colias croceus* (= *edusa*) *Synchlœ belemia*, etc., being there seen in astonishing numbers. But in June the numbers rapidly diminish here, as the heat asserts itself, whereas in the highlands in July the abundance of lepidoptera is again amazing. The satyrs, *Epinephele jurtina* and *E. lupinus*, for instance, rise up in fluttering clouds accompanied by numbers of the gorgeous "Jersey Tiger" *Callimorpha quadripunctata* (= *hera*), as one moves about beneath the trees. In October some new broods appear, but not in such numbers as in the Spring. A few, such as the small cabbage white (*rapæ*), bath white (*daplidice*) and clouded yellow (*crocea* = *edusa*), continue almost throughout the year.

In character the butterfly fauna of Mesopotamia, like the flora, which of course largely determines it, is much more English than that of the fauna of say, the South of France, and the fact that a large proportion of the forms are either the same as or nearly akin to English species at once strikes the collector. *machaon*, for instance, is the only *Papilio* found below the highlands; and other examples of English forms are *rapæ*, *daplidice*, *croceus* (= *edusa*), *pamphilus* and *atalanta*; besides the more widespread brown argus (*astrarche*), *megæra*

ticarus, and *flava* (= *thaumas*) ; and of course the ubiquitous painted lady (*cardui*) and long tailed Blue (*bœticus*).

It is noteworthy that although *P. machaon*, *Melitea persea* and *Euchlo* are found together on stony ridges as in India, their other associate there, *Ypthima bolanica*, is not represented in Mesopotamia by any of its genus.

The Editor has asked for Keys and brief descriptions so that collectors may recognize their captures.

A. Forms from Mesopotamia :—

Danaidæ.

1. *Danais chrysippus*, L.

Satyridæ.

2. *Pararge megœra*, L. Subsp. *iranica*, Riley.
3. *Satyrus telephassa*, Hb.
4. „ *persephone*, Hb. (=*anthe*, O.) f. *hanifa*.
5. „ *briseis*, L. Subsp. *magna*.
6. *Epinephele lupinus*, Costa. ssp. *centralis*, Riley.
7. *Precis* (*Junonia*) *orithya*, L. Subsp. *here*, Lang.
8. *Pyrameis cardui*, L.
9. „ *atalanta*, L.
10. *Polygonia egea*, Cr.
11. *Melitœa trivia*, Subsp. *persea*, Koll.

Papilionidæ.

12. *Papilio machaon*, L. Subsp. *centralis*, Stagr.
13. *Thais cerisyi*, Bdv. var. *deyrollei*, Ob.
14. *Doritis apollinus*, Herbst.

Pieridæ.

15. *Belenois mesentina*, Cr.
16. *Pieris rapœ*, L. Subsp. *iranica*, LeCerf.
17. *Pontia daplidice*, L.
18. „ *glauconome*, Klug.
19. „ *chloridice*, Hb.
20. *Euchlœ ausonia*, Hb. Subsp. *persica*, Ver.
21. „ *belemia*, E.
22. „ *charlonia*, Subsp. *transcaspica*, Stgr.
23. *Zegris eupheme*, E. Subsp. *dyala*, Peile.
24. „ „ Subsp. *tigris*, Riley.
25. *Colias croceus*, Fourc. (= *edusa*, Fab.)
26. *Teracolus* (=*Colotis*) *fausta*, Ol.

Lycænidæ.

27. *Lycœna astrarche*, Berg.
28. „ *icarus*, Rott. Subsp. *persica*, But.
29. *Heodes* (*Chrysophanus*) *phlœas*, L.
30. *Zizera karsandra*, Moore.
31. „ *otis*, Fab.
32. *Chilades galba*, Led.
33. „ *trochilus*, Frey.
34. *Lampides* (*Polyommatus*) *bœticus*, L.
35. *Tarucus theophrastus*, Fab.
36. „ *balcanicus*, Fr. *areshanus*, B. Baker.

HESPERIIDÆ.

37. *Carcharodus alceæ*, E.
38. *Gegenes nostrodamus*, Fabr.
39. ,, *lefebvrei*, Rambur.
40. *Thymelycus* (*Adopæ*) *lineola*, Ochs.
41. *Hesperia geron*, Watson.
42. ,, *proto*, Esp.
43. ,, *alveus*, Hbn.
44. *Parnara mathias*, Fab.

B. **Additional forms from N. W. Persia and Kurdistan :—**

45. *Agapetes larissa*, Subsp. *iranica*, Seitz.
46. *Cœnonympha pamphilus*, L. f. *hylas*, Esp.
47. ,, *saadi*, Koll.
48. *Satyrus pelopea*, Klug.
49. ,, *hermione*, L. Subsp. *syriaca*, Stgr.
50. ,, *circe*, F.
51. ,, (*Nytha*) *parisatis*, Koll.
52. *Epinephele jurtina*, L. Subsp. *persica*, LeCerf.
53. ,, *telmessia*, Subsp. *kurdistana*, Ruhl.
54. ,, ,, Subsp. *palescens*, Butler.
55. ,, *mandane*, Koll.
56. *Limenitis rivularis*, Scop. (=*camilla*, Auctt.)
57. *Argynnis maia*, Cr. (=*pandora*, Schif.)
58. ,, *latona*, L. (=*lathonia*, Auctt.)
59. *Melitœa didyma*, Subsp. *casta*, Koll.
60. *Polygonia* (*Vanessa*) "C" *album*, L.
61. ,, ,, *egea*, Subsp. "J" *album*.
62. *Libythea celtis*, Fuess.
63. *Papilio podalirius*, L.
64. *Pieris napi*, L. *pseudorapæ*, Ver.
65. ,, *ergane*, Hbn.
66. *Euchlœ gruneri*, H.-S. Subsp. *armeniaca*, Chr.
67. *Gonepteryx farinosa*, Z.
68. *Lycœna dama*, Stgr. Subsp. *karinda*, Riley.
69. ,, *peilei*, B. Baker.
70. ,, *damone*, Ev. Subsp. *damalis*, Riley.
71. ,, *admetus*, Stgr.
72. ,, *bellargus*, Rott.
73. ,, *baton*, Berg. Subsp. *clara*, Stgr.
74. *Heodes* (*Chrysophanus*) *thersamon*, Esp. *kurdistana*, Riley.
75. ,, ,, ,, Esp.
76. *Cyaniris argiolus*, L.
77. *Aphnœus epargyrus*, *marginallis*, Riley.
78. ,, *acamas*, Klug. *hypargyros*, Butler.
79. *Cigaritis maxima*, Staud.
80. *Zephyrus quercus*, Dal. *longicauda*, Riley.
81. *Strymon* (*Thecla*) *abdominalis*, Gerhard, f. *gerhardti*, Staud.
82. ,, ,, *ilicis*, E. *caudatula*, Zell.
83. ,, ,, *marcidus*, Riley.
84. *Eogenes alcides*, Herr. Schaeff.
85. *Thanaos marloyi*, Bov;
86. *Carcharodus altheæ*, *bœticus*, Rambur.
87. *Hesperia orbifer hilaris*, Staud.
88. *Thanaos tages*, L. var. *unicolor*, Freyer.

The eight forms named by Riley, one by B. Baker and one by the writer, were found to be new.

DANAIDÆ.

Genus DANAIS, Latr.

D. chrysippus, L., Seitz. Vol. 1·28 c. F. Br. Ind. (Bingham), Vol. I, Pl. 1.

Key: Tawny brown, f.w. with white bar of spots near apex. Terminal margin of wings black with white dots.

The Mesopotamian form is f. *chrysippus.*

Seen in small numbers in June and again in Oct., Nov. and December; frequents thistles and mint flowers.

Localities.—Basra and Kut-el-Amara, seen occasionally (Major T. D. Broughton); Kizil Robat; Khanikin, S. E. Europe, S. Asia, the whole of Africa and Malayan and Australian region.

ab. *alcippoides,* M., one example taken at Kizil Robat, Nov. 17th at mint, having two-thirds of disc of hindwing white. The writer has not come across in Mesopotamia the *Asclepias* species which is the usual food-plant in India.

Genus AGAPETES, Billb.

A. larissa, Hb. Subsp. *iranica,* Seitz.

Key: An irregular broad discal cream white band across both wings; basal and postdiscal portions of wings black, an oblong black spot in centre of forewing.

Upperside: forewing ground colour, cream white; basal third mostly black; a sinuous black line across cell, the outer and posterior portion of the cell within this line cream white; an oblong black spot in centre of wing, between veins 3 and 4, and another black blotch to its inner side anteriorly. Apex black with two large spots of the ground colour a submarginal row 7 spots of the ground colour one in each interspace and connected with a corresponding submarginal row of small conical spots.

Hindwing.—Basal third black except for a bar of the ground colour from its centre forwards. A broad angled discal band with indications of two ocelli in it posteriorly, a submarginal row of conical cream white spots and black marginal line.

Underside: darker cream tinted. Forewing a sinuous black line across middle of wing, and two black blotches near posterior angle. *Hindwing:* there are indications of three black ocelli posteriorly and of one anteriorly; and of a row of black sagittate markings beyond these.

This form from the Karind valley in N. W. Persia is fairly normal and almost devoid of markings beneath. It is in June and July very common at 5,300 ft. By July 13th the great majority of individuals seen had the wings very much torn, apparently by the long needle like spines of the yellow thistle which it frequents. It is a heavy flier and very easily caught. None were seen later than July. The species seen by Lt.-Col. Watney on June 18th in the Bazian Pass in S. Kurdistan was probably this.

1 ♂, 14 ♀♀ from the Karind valley, July 13-17, 1918; all except 8 ♀♀ are now in the British Museum. Capt. N. D. Riley remarks on them as follows:—

"Figured in Seitz Pl. 39b as *parthica* and placed as a race of *hylata,* Men. In his description of *hylata* Men. expressly states of the wings 'base immaculate' and from the rest of his description *hylata* can only be the *Taliche* form of *titea.* Similarly his *teneates* is obviously the *Taliche* form of *japygia.* I am not able to separate *iranica* except as a race of *larissa.*"

Cœnonympha saadi, Koll.

Harir, 15-16 July, 4 ♀.

Note by Capt. Riley:—"Badly worn, certainly not var. *mesopotamica*, Ruhl. which is a much more faintly and differently marked form. The markings approach *mesopotamica* in these specimens in appearance, mainly owing to their worn condition."

Cœnonympha pamphilus, ssp. **hylas,** Esp.

1 ♀, Suwarra, July 1919. (Capt. Aldworth).

GENUS SATYRUS.

A. *Bands above white* .. ..*briseis.*
(Brown tinted forms of ♀ of *briseis* may be distinguished from the following species by their uniform reddish tinted underside)

B. *Bands above brown tinted* .. ..*hermione.*
(The pale band on the hindwing above is much nearer the margin and not central as in *briseis*).

C. *Bands above tawny.*
a. Band containing white dots.
*a*1. Band of f.w. broadly divided at the white dots; underside earth brown .. .. ..*pelopea.*
*b*1. Band not broadly divided underside greyish ..*telephassa.*
b. Band without white dots .. ..*persephone.*

S. telephassa, Hb., Seitz. 1·43c. (87 examples).

This grayling is of a rather dark grey brown ground colour with a subterminal irregular *tawny* band on both wings, containing in f.w. two black, usually white centred, eyespots in interspaces 2 and 5 and between them two white dots, and in h.w. 2 minute, but complete spots in interspaces 1 and 2, the white centres being more prominent. There is always in f.w. a sharp angle or tooth of the ground colour encroaching on the band on its inner side and rarely dividing it; on the h.w. the band does not reach the costa.

♂ with a black and very distinct band or sex-mark in the cell. The ♀ is of course without this and is also a good deal larger.

Underside of h.w. grey striated with darker, and usually with a fairly distinct narrow whitish angled postmedian band.

Expanse:—♂ 60 mm. (2¼ in,) ♀ 70 m.m. (2¾ in.). Common both in Mesopotamia on the Dyala at Kizil Robat and a few by the Tigris at Baiji; N. W. Persia, Harir and Kermanshah common.

Kizil Robat, March to May; Khanikin, October; N. W. Persia, Karind Valley, July, August, September; Buxton notes Qasvin, September, worn females found flying among dessicated plants.

S. persephone, Hb., Seitz. 1·42e, Ochs. over 70 specimens.

Larger and darker than either *telephassa* or *pelopea* and the ♂♂ are shaped as ♀♀ and of the same size.

♂ with band light ochreous, tinted in places with tawny. The eyespots without white centres, and the dots absent. The prolongation of the band to costa of f.w from the upper eyespot is narrow and well marked. On the h.w. it does not nearly reach tornus.

♀ with the band bright tawny.

♂ without sexmark.

Underside more boldly marked on both wings than in the other spp. hindwings with a white subterminal line as well as a white postmedian band, which is bordered inwardly with a black line. Expanse 72 mm.

Capt. Riley, having examined 57 of the specimens from Fathah (=Baiji) and Kizil-Robat, remarks:—"All are referable to the form *hanifa*, Nordm. The typical pure white banded form does not seem to occur; the majority of the females have the bands uniformly rich fulvous, but in 3 females and in most of the males they are much broken or almost replaced by pale yellowish. It has been suggested that the dark ochreous and the light forms are seasonal. In Kedos and Yezgat in Asia Minor both extremes seem to occur at the same time, and the species appears to be single brooded as in S. Russia. Col. Peile's specimens are certainly all of the Spring brood and all dark; it is unfortunate he was unable to secure any of the Autumn brood. (As mentioned below, I when without a net put up a few one evening at Nineveh late in October when at Mosul for three days only. H.D.P.) A further character in addition to the white veining of the underside which may serve to separate *S. persephone* from *S. enervata* in the male sex is the great prominence of the black sex-mark of the latter across the bases of areas 1b (part) to 3."

Localities:—Mesopotamia—Bank of Dyala at Kizil Robat, April, May 1919. 32 specimens. Bank of R. Tigris at Baiji near Fathah. April-May 1920, over 40 examples.

In typical *persephone* the veins of h.w. are white below and the bands above often wholly white.

Lt.-Col. W. H. Evans to whom specimens of *persephone* from Baiji (on the right bank of the Tigris) were sent, remarks in epistola:—"The localities Seitz gives are—

anthe.—Black Sea, S. Russia, Armenia, Afghanistan and Persia.
enervata.—C. Asia, Altai, Thian Sham and Turkestan.

The veins underneath in Chitral specimens could hardly be described as white. In yours they are just beginning to be so; so perhaps yours are half way to *enervata* and my Chitral ones (same as C. Asian which I have seen) are *enervata*. Above there seems no difference whatever. In the Spring, Chitral ones are tawny, some males being nearly white. In the Autumn they were all white, with signs of being tawny. The tawny form is *ab. hanifa*."

So far in 1919 and 1920 only the spring brood has been taken, but the writer one evening in October 1919 at Nineveh put up some dark graylings probably of this species. *anthe*, Ochs., is from Russia, and always in the type has white veins on the underside of h.w., but the form *enervata* is without these and is much more tawny and regarded as separate by Elwes, but placed under *anthe* in Seitz.

S. pelopea, Klug. Seitz. 1·43 f.

Similar to *telephassa* but smaller, and the band lighter in colour, ochreous or earthy brown, not tawny, and always in forewing broadly divided by the ground colour below the first eyespot, and in hindwing reaching the costa. The sex-mark of the ♂ is much more obscure, and the white dots of forewing in both sexes more distinct.

Underside of hindwing more brown than grey and more uniformly marked.

Expanse.—♂ 54, ♀ 66 mm.

N. Persia: Karind, Harir and Kermanshah, July 16th to September, nineteen examples, 5 ♂, 14 ♀.

Capt. Riley notes on these specimens:—"Much nearer typical *pelopea* from Syria than to any of the named forms, *persica*, *schahrudensis*, *tekkensis*, &c., the underside not quite so red, more mixed with grey and white, the latter

colour especially prevalent across the disc of the wing, bordering the zig-zag transverse line.

This whiteness or paleness is the most conspicuous feature of the specimens : they are mostly rather worn."

S. parisatis parisatis, Koll.

28 specimens from Paitak, the Takigerra pass and Karind Gorge, from mid July to mid September; and one ab. from Harir mid July 1918. Capt. Riley notes:—"These all belong to the typical form of the species, which was described from Farsistan, the S. E. end of the mountain system which divides the Persian plateau from Mesopotamia and the Persian Gulf. It is characterized by its generally small size, the somewhat indefinite inner margin of the white marginal border of the forewing and the rather strong development of the common white band of the underside.

The general tone of the underside is very *grey* and white."

LeCerf (Ann. d'Hist. Nat. 1913) has overhauled this species excellently and set right a great deal of confusion. The only point which still seems to need investigation is the locality of his type-specimens of *S. parisatis* var. *parcis*, which he describes from Nepal (Tola). It is the B. M. forms from Upper Kumaun, Kangra, Kalapani near Abbottabad, Mandi, Mussoorie, Murree and Urni, but not from further East, nor can I find any record of its having been obtained further East."

Common in N. W. Persia from 2,500 to 6,000 ft. settled in large numbers in holes in the side of a limestone cliff, and at water on the road and on stones around springs. In the open they had to be approached cautiously, but a sweep of the net into the fluttering crowd in a large hole in a rock secured about a dozen at once. An aberration taken at Harir, 16th July 1918, has:—

Underside transverse fascia absent from forewing replaced by a dusky black band on hindwing.

Localities.—N. W. Persia—Paitak, 2,500 ft. at the foot of the Takigerra Pass; by the Greeco-Persian arch in the pass, August 7-8th; and the Karind valley 5,300 to 6,000 ft. mid July to 19th September 1918; Kurdistan, Suwarra, July 1919.

S. circe, L.

A fine famale, taken by Capt. T. P. Aldworth at Suwarra (5,400) early July 1919.

S. briseis, L., sub-sp. **magna,** Stgr., Seitz. I. p. 124. 51 specimens.

♂ Upperside forewing ground colour sooty brown with a cream white discal band broken up into spots by the dark veins. Apical cream patch divided by a black spot and the band containing in the third interspace another spot. Costa and terminal margin dingy cream; two dark blotches divided by discoidal cell.

♀ differs in being larger, with larger eyespots, and with underside usually reddish stone-colour. The hindwing being almost uniformly so.

♀ dimorph (*pirata*, Hb.) with dull chestnut instead of cream bands, otherwise like the normal form of the ♀.

Very common at 6,000 ft. in N. W. Persia, from about the middle of June to end of September. On 27th June 1919 a male in fresh state was taken at Kizil Robat in Mesopotamia, the strong wind blowing at the time having probably carried it from the direction of the Persian hills. At Suleimanyeh in S. Kurdistan a worn male was taken on September 1st, 1919; and on September 21st (1918) a worn female was taken at Harir at 5,800 feet in the Karind valley.

N. Persia. These dates give some indication of its time of occurrence. Most were taken in shady spots by stone walls, rocks and roots of trees; where they were difficult to detect. When put up they flew only a few yards and were easily secured by dropping the net over them with the tail of the net held up when they invariably rose up into it.

Localities;—Mesopotamia: Kizil Robat, the Dyala. N. W. Persia: Karind valley 5,300-6,000 ft. S. Kurdistan: Bazian Pass, Suleimanyeh.

Of 33 specimens examined from the localities above mentioned, Capt. Riley remarks:—"6 ♀ are of f. *pirata*, Esp. All are referable to the ssp. *magna*, Stgr. Underside very sandy. The 1 ♂ from Suleimanyeh has white band of forewing so wide that the blind ocellus of forewing upperside in area 2 is completely separated from the marginal dark border (as in the ♀)."

Buxton notes, Qasvin, 16th July-6th September 1919.

S. hermione, ssp. **syriaca,** Stgr.

1 ♂, 1 ♀, Suwarra; early July 1919, ex. Capt. Aldworth.

Capt. Riley notes:—"Recorded from Lenkoran (S. E. Transcaucasus) by LeCerf. N. Syria nearest locality in B. M. Seitz gives Mesopotamia, *i.e.* (probably) Malatia.

Genus PARARGE, Hb.

P. megæra, L., Subsp. *iranica*, Riley, and variety from Mesopotamia.

Compared with English specimens, eyespots somewhat larger, both the dusky ground colour and the tawny marks are paler in tone, these last also reduced in area. The postmedian tawny band of h.w., which is well marked in English specimens and sometimes united with the tawny patches surrounding the eyespots, almost obsolete. Underside greyer, less brown.

18 specimens; Kizil-Robat. 2 ♂♂; 23rd March.

Karind Gorge, ♂, 2 ♀♀; Harir 3 ♂♂, 10 ♀♀, July and August. All except 5 ♀♀ now in the British Museum.

Of these Capt. N. D. Riley remarks:—"Underside of hindwing lighter yellowish than in true *lyssa*, Bois., in that respect agreeing with Herrich-Schaeffer's description of *megærina*. Herrich-Schaeffer states, however, that the upperside of *megærina* is that of Hubner's fig. 914, *i.e.*, *lyssa*. The upperside of these specimens is more that of Staudinger's *transcaspica*, *i.e.*, with the much obscured hindwing, but the underside of the hindwing is much darker than in that form. The specimens are rather smaller than *transcaspica* and *lyssa* in the British Museum. Specimens referred by LeCerf to var. *megærina* are probably of this race. I can only regard *megærina* as a form of *lyssa* with yellower underside to the hindwing. The 'differences' given by Herrich-Schaeffer apply equally well to any form of *megæra*.

In addition there are in the British Museum 1 ♂, 1 ♀, from Mungereah Mountains, and 1 ♂, 1 ♀ from Gulek Taurus, which latter though rather larger than the others agree in all other respects.

One of the 2 males taken by Col. Peile at Kizil-Robat is unusually dark on the upperside, the distal yellow spot in area 1b of forewing being almost entirely obscured by black and the fulvous markings being of a very dark shade. The other male taken on the same day is quite normal."

Capt. P. A. Buxton notes:—"2 ♂, 2 ♀, 26-30th March, Menzil. These are not *lyssa*, they are very bright and red on the upperside."

Lt.-Col. Watney took a ♀ at Kizil Robat, February 1919.

The dark Mesopotamian example was taken about the crest of the ridge of the Jebel Kizil Robat about stony hill crests. The ♀ probably at rather lower elevation. Others were taken about the stone walls of vineyards at Harir in N. W. Persia.

Localities:—Mesopotamia—Kizil Robat, ♂ 2, ♀ 1. Feb.-March 1991, N. W. Persia, Harir, Karind valley, ♂ 1, ♀ 5, 13th-15th July 1918.

Genus EPINEPHELE, Hb.

E. lupinus, centralis, Riley.

♂ not unlike *jurtina* ♂ but smaller, forewing more sharply pointed at apex of a snuff-brown on costa and terminal margin, which shows up the black brand more. Ocellus at apex of f. w. often blind. Hindwing more dentate. Underside of forewing tawny with grey margins and ocellus at apex small and pupilled. Hindwing below grey striated and speckled with darker with traces of a darker central band but no eyespots. ♀ ground colour dark-grey brown, with the terminal area sharply marked off and containing in f. w. two blind eyespots in pale yellow suffused rings. Occurs, but seems to be rare, in Mesopotamia, but in N. W. Persia is abundant in company with *E. jurtina*: at Kizil Robat a few males and a female were taken in April and May 1919 on the bank of the Dyala and one male on the plateau nearby: and three females by the Dyala at the Jebel Hamrin on June 25th in 1918.

Although the male at first sight somewhat resembles a dull meadow brown, the females of the two species are very dissimilar.

Lupinus sometimes settled on leaves in half shade some 5 or 6 feet from the ground.

Regarding 58 specimens from Mesopotamia (11); N. W. Persia (Karind Valley and Kermanshah (45), and Suleimanyeh (2). Capt. N. D. Riley makes the following interesting note:—"Staudiger's description of *E. lycaon* var. *intermedia*, runs as follows: The almost universally common species *E. lycaon* is a species very variable as to size, nature of hair-scales, colour, etc.

The large examples from S. E. Europe with the forewing more lightly covered with long hairs was described long ago as var. *lupinus*, Costa. In the lower lying (hotter) districts of Central Asia and Asia Minor as well as in S. Russia (according to Alpheraki) an intermediate form occurs which I call *intermedia*. Specimens are much larger than typical German *lycaon* and almost as densely hairy as the still larger *lupinus*, but darker and mostly with a broader (shorter) androconial stripe (or rather patch) on the forewing. Also on the underside of the hindwing they are almost always much lighter (more greyish-white) than *lycaon*, especially examples from Samarkand, almost like typical *lupinus*. I have this var. *intermedia* from Samarkand, Margelan: also one specimen each from Saison and Lepsa (presumably taken in other hotter districts) I must include with them. In the same way examples from Amaria and Achal Tekka District would be best included here, although the Amaria specimens are darker on the underside.

From this typical Staudinger description it at least appears that true *intermedia* is the Samarkhand, Margelan race. Hence Turati's *margelanica* must fall as an absolute synonym of *intermedia*. In Mesopotamia, Kurdistan and Western Persia occurs a race somewhat similar to *intermedia* but characterised by its smaller size, greyer appearance (the females particularly being very dark above, with very little orange as a rule) and the greater uniformity of the markings of the underside of the hindwing, the banded appearance of *intermedia* being absent or almost so, in the majority

of specimens. This may be known as *centralis*. (Types: B. M. Types No. Rh. 169 ♂, 6-5-19; 170 ♀, 7-5-19, Kizil-Robat, L. bank of R. Dyala, H. D. Peile). Somewhat similar, but characterised by very much darker underside to the hindwing, larger size, longer and yellower hair-scales occupying a more extensive area, is the Asia Minor race (*captus*, B. M. Types No. Rh. 171, ♂, 1-7-18; 172, ♀, 24-6-18, Kedos N. V. L. Rybot). This race is very intermediate between *lupinus* and *centralis* in all respects. It is also in the B. M. from Brussa, Kilishlar, Gulek and Yazgat and, according to Staudinger, occurs at Amasia. Finally the race from Cyprus may be mentioned. It represents the extreme in depth of colouration in both sexes above and below, with the only exception of the male of *mauritanica*, Oberth , which is blacker above. The female has, by comparison, an almost sooty appearance above and the yellow markings are of a very deep shade (*cypriaca*, B. M. Types No. Rh. 173, ♂, 24-5-09; 174, ♀, 9-5-09, Nicosia, Cyprus, J. A. Bucknill)."

Buxton records "*lupinus*, Costa, ♂ 6th September 1919, ♀ 18th July 1919, Qasvin, determined by genitalia, bad specimens."

E. jurtina, ssp. persica, LeCerf.

3 ♂, 14 ♀, from Harir and Karind where it is far less common than *E. lupinus centralis* in company with which it is found there.

Capt. Riley notes:—"All agree with LeCerf's description and figures A tendency to reduplicate the apical ocellus of forewing is rather marked."

E. telmessia kurdistana, Ruhl.

Three females from Suleimenyeh, Kurdistan, 31st August and 1st September 1919, taken among bushes on the bank of the Kalisan river.

Smaller than *palescens*, the female above darker purplish grey, forewing with the fulvous area small and turning into a light yellow ring above eye-spot. Underside hindwing more uniform light grey, striated with darker, and without the well marked broad pale postmedian band of *palescens*.

E. telmessia palescens, Butler.

N. W. Persia: Karind Gorge, 13th July 1918, 2 ♀; Paitak, 6th August 1918, 1 ♀; Harir, 10th August 1918, 1 ♀.

Capt. Riley notes:—"LeCerf appears to have overlooked Butler's description of *E. palescens*, as his *areas* seems to be identical with it. *Palescens* was described from Dizful in N. W. Arabistan."

In this race the fulvous discal band also extends towards the base, and the hindwing beneath have a purplish grey basal half and a broad postmedian almost whitish grey band, and with some yellow markings or suffusion on its inner side.

E. mandane, Koll.

2 ♂, 24 ♀, Hari, 15th July to 16th August 1918.

Can be told at a glance by the long blind eye-spot at apex of forewing. It has underside similar to *davendra*, but the white central line of hindwing is curved gently, not angled at all. (*Wagneri*, the race from N. Kurdistan, has ground-colour deeper, and the apical spot on forewing shorter.)

Capt. Riley notes regarding the above specimens:—"Typical *mandane* as described by Kollar from Farsistan, S. W. Persia. 8 ♀, have an additional blind ocellus on forewing in area 2 on upperside, and one of these has a furthur supplementary one in area 6."

Common about stony ground and at flowering mint by water at 5,300 to 6,000 ft. in the Karind Valley, N. W. Persia. Among stones in the open it is rather wary, but when settled at mint is easily caught. Taken from mid July to mid September 1918. There being only 2 males to 24 females taken seems to indicate that the season was rather late for this species.

Limenitis rivularis, Scop. (=**camilla**, Auctt.; **drusilla**.)

Of 9 ♂, 8 ♀ examined, taken in the Karind Valley 5,300-6,000 ft. from 13th July to 12th August 1918. Capt. Riley notes:—"LeCerf only gives var. *reducta*, Stgr. from Persia. These specimens are by no means referable to that form, which is represented in the B. M. by 2 ♂, from Hadschyabad (Haberhauer), 1 ♂, "Caucasus" (Lederer) and 1 ♂ Derband (Christoph). They are not separable from the European form unless perhaps by an average reduction of the red markings of the underside."

In perfect condition in mid July; common in August, and fond of settling on projecting boughs about eight feet from the ground, in a glade, now and again sailing about between the trees and often returning to the leaf it had left. Many settled on stones by a spring on August 12th at Karind Gorge. One taken 9th September at flowering mint, and one seen 19th September 1918. Taken also by Capt. Aldworth at Suwarra, Kurdistan, July 1919.

GENUS ARGYNNIS, Fab.

A. maia, Cr. (=**pandora,** Schiff)

Seitz. 1·71c. (**pandora**)

This very handsome fritillary is common in the Karind Valley and at Kermanshah in Persia. At 6,000 ft. in a beautiful gorge said by some to be the garden of Omar Khayyam, numbers were, in July 1918, sailing about the walnut-trees and, with the "Jersey Tiger" moth (*Callimorpha quadripunctata* =*hera*) greatly enhanced the beauty of its surroundings. Very common in mid-July, it was rather less so in August, and a few only were seen there on 19th September.

Both sexes are fond of resting suspended with closed wings on the underside of walnut-leaves on the sunny side of the trees. As one strolled beneath the trees they sailed away to sport with others, three and four together in a glade or about the cascades in the gorge below. Within an hour twenty in fresh condition were taken settled on the underside of leaves. They settled also among the pale green young foliage of apricot trees, and at thistles. Pairs were seen mated in mid-July. Males were observed at thistles on the open hillside at Kermanshah at the end of August, and Major Broughton, who also took it there, found it common in September 1918, in gardens flying round willows and fruit-trees. When settled on the underside of leaves of walnut and apricot, with the sunshine coming through the leaves they were very inconspicuous, only the green and silver being visible, particularly with the wings seen edge-ways from below. A large wild *viola* grew in the glades in the gorge, but no fritillaries were seen about these plants.

Localities.—N. Persia, Karind Valley 5,300-6,000 feet; Kermanshah. Occurs in South Europe and Asia Minor. According to Kirby the larva feeds on the wild heartsease.

The habits of this species in Macedonia are mentioned by Mr. H. Mace in the Entomologist, Vol. LIII, p. 64.

A latona, L. (=**lathonia**, Auctt.)

Buxton notes having taken it at Menzil, 2,000 ft., 30th March 1919, common but worn.

GENUS MELITÆA, Fab.

M. trivia, Schiff., Sub-sp. **persea**, Koll. Seitz. 1, 66d.

In the Brit. Mus. and by Lt.-Col. W. H. Evans, this form is classed under *trivia*, Schiff., but Lt.-Col. Bingham (F. Br. Ind. Butt. Vol. 1, p. 453), described it as a race of *didyma*, Esper. *trivia* and *didyma*, like all forms of *Melitea*, vary greatly and are both widespread.

KEY: Bright tawny with scalloped black marginal band and small black spots above.

Underside apex of f.w. cream dotted with black, hindwing cream-white with broken curved bands of tawny and small black spots, the terminations of veins prominently black. Female, larger than male and hindwing beneath more cream tinted.

Usually rather scarce where it is found, though in March rarely one may secure a dozen in a morning. The dry-season or June-July brood is apt to be scarcer in collections than the other owing to the excessive heat, the forbidding region where it occurs preventing much collecting. For these little butterflies seem to delight in the hottest sunshine, with a temperature even in the shade of 120° F.; and the males being very small are particularly difficult to follow with the eye in the glare and with perspiration streaming over one's eyelids. Indeed with a prospect of getting possibly a few little *Melitea*, or very likely none, for one's trouble, the collector needs to be an enthusiast to go out into the heat and glare on these stony hills in June or July. These butterflies must no doubt find dew or flowers of some sort on these seemingly bare hills where they can renew the moisture of their small bodies in this awful heat, where almost their only companions seem to be the large spiny-tailed lizards (*Uromastix loricatus*).

The habits of *Persea* here are like those of the race on the N. W. Frontier of India on the Jebels or low hills at 400 to 600 feet elevation in Mespotamia. the males settle on the stony ground at the crests of the ridges, now and again rising to sport with some passing butterfly, and again settling with wings spread to the sunshine.

Usually when put up they soon settle again near the same spot. Being small they are not very easily seen when settled; so on coming up to a hill-crest it is best to watch the sky-line when a *Melitea* may be seen to rise up to meet some rival and settle again on the ground, where the net with tail and held up may be dropped over it. If the end of the net is not held up the butterfly is apt to damage its wings against the stones. Females are much the rarer, and may be met with unexpectedly: perhaps settled on the ground near a camp, or at a flower. Freshly emerged examples were taken on 16th March 1919; on 21st May worn specimens only were taken. The previous year some in fresh condition were taken on 27th June.

An autumn brood, such as occurs on the N. W. F. of India, is probable also in Mesopotamia. Females were seen flying along the sides of stony ridges without settling, while the males kept often settling, about the crests both in Mesopotamia and on the North West Frontier of India, where too a mated pair were taken settled on the ground of the summit with a second male hovering about them. So these stony hill-crests would appear to be their mating places, the males waiting there to waylay the females as they come by. Lt.-Col. Watney took this Sp. at Baghdad far from any hills on April 19th, 1919. A pale form *var robertsi*, Butt., also occurs on the N. W. F. of India.

Localities :—Jebel, Kizil Robat, on Dyala, 16th March to 9th April, 21st May 1919. Jebel Hamrin, Dyala, 27th June 1918. At Fathah on Tigris, 11th April, 19th June 1920. Baghdad, 19th April 1919.

N. W. Persia ; Karind valley. August 1918, occurs also on N. W. Frontier of India and Afghanistan.

Spring Brood.—Kizil Robat, 16th March to 3rd April, 32 ♂, 3 ♀ ; Fathah, 11th April.

Summer Brood.—Fathah, right bank of Tigris, 17th June 1920 ; Jebel Hamrin, bank of Dyala, 27-28th June 1918.

Capt. Riley notes :—"The summer brood is constantly smaller, much lighter and sandier, the black markings very much reduced in size and depth, above and below."

M. didyma. casta, Koll.

Harir, 9th August 1918, 1 ♂ ; 12th August 1918, 1 ♀.

Capt. Riley's note continues :—"Taking Kollar's descriptions of *casta* and *persea* in conjunction it appears very obvious, especially as he also records *M. phœbe*, that one must refer to the Persian race of *didyma*, the other to that of *trivia*. And, from an examination of the series of both species from Mesopotamia and Persia in the B. M., I am convinced that, contrary to the general usage, *persea* represents the race of *trivia* and *casta* that of *didyma*.

I give below a translation of Kollar's description (Deustch. Akad. Wissen. Wien, I, p. 50, 1850). A character I have found of use in separating these two species is the position of the black marks in areas 2 and 3 of the hindwing underside, between the orange bands. These markings are generally, in each area, three in number, and in *trivia* the middle one is nearer the distal one ; in *didyma* nearer the proximal one."

Kollar Deut. K. K. Akad. Wissen Wien, I, p. 50, 1850.

Melitæa casta —Wings above fulvous, the costal strigæ of forewings and a broad submarginal fascia common to both wings and the margin itself black ; hindwings pale yellowish, with two very pale fulvous bands, the broad stripes and the series of black marginal spots less distinct. Exp. 15‴-17‴.

Next to *M. didyma*, from which, however, it differs most in that the wings above have fewer black bands and spots, and that the bands of the underside of the hindwing have almost disappeared.

Melitæa persea —Wing above fulvous ; forewings with three black macular bands, hindwings with two ; below, the apex of the former and the whole of the latter pale yellow ; the macular bands of the forewings (below) conforming with those of upper surface, the hindwings with two pale fulvous bands and black lunules and spots. Exp. alar. 17.‴

Similar to the preceding but the markings of hindwings on the underside, which is *casta* in very similar to *didyma* ; in this manifestly differs and comes closer to *M. didyma* (sic !, ? some other species intended) from which, however, it ought to be separated owing to the failure of the black spots especially at the bases of the wings.

persea must be *trivia*, ssp.
costa ,, ,, *didyma*, ssp.

GENUS JUNONIA (Precis).

J. orithya, L., Seitz. 1.62b. ssp. **here,** Lang.

KEY : Bases black, outwardly broad bright blue, with a white apical bar on the forewing. There are two red ocelli on each wing near the margin.

Common near Basra and Shaiba ; scarce at Kut (Major Broughton, R.E.).

Baghdad, October, several taken; Babylon, January; Amara, May; Baiji near Fathah, in June; Khanikin, October.

Buxton took this at Amara in May, July, September, October and November.

Baghdad, 31st October 1920—5th November 1920, 1 ♂, 6 ♀.

Key to the forms of Pyrameis, &c.

A. Upp. f.w. apex black with white spots.
  a. Vermilion band across both wings. .. .. ..*P. atalanta.*
  b. Upperside hindwing, terminal half sallow yellow ..*P. cardui.*
B. A conspicuous small white L. shaped mark on underside of hindwing .. ..*Polygonia egea.*
C. A large conspicuous white C. on U. h. w. .. .. ..*P. c-album.*

GENUS PERAMEIS, Hb.

P. atalanta, L., Seitz. 1. 62c.

The "Red Admiral."

Black velvety ground with transverse bands of dark vermilion on f.w. and on hindwing an outer marginal band of same enclosing four black spots. Apex of f.w. velvety black with one large white spot and five smaller ones. H. w. with a small double blue spot at tornus. Underside of f.w. as above, but bands pale, parallel and followed by some bluish markings. The apex stone-coloured; of h.w. richly marked with dark and light brown, bluish and stone colour.

A few taken at Kizil Robat on the Dyala in November 1918 at mint flowers and hibernated specimens in March. Mosul "3 or 4, all a very small variety" (Capt. Aldworth).

Localities:—Mesopotamia—Kizil Robat, Mosul. Throughout Europe, N. Africa, W. Asia, N. America, Hamarin Isles. As with other migratory butterflies, it varies little geographically.

P. cardui, Lin., Seitz. 1. 62d.

Larva. Blackish brown, with a longitudinal pale interrupted line on each side. The segments armed with short branched spines. Feeds on thistles and *Artemisia*. Pupa "tuberculate: head bluntly cleft, pale ochraceous or brown, more or less spotted with yellow."

Abundant in Mesopotamia, especially in April. Basra abundant, Sheik Saad, common in April 1917, disappearing during hot weather (Major T. D. Broughton, R.E.). Amara, May 1918. Kizil Robat on R. Dyala 1919. January 20th and Feb. 19th common; March 6th in thousands at flowers, rather worn; April 4th a fresh brood appearing: 10th abundant, many flying West: 19th abundant both battered old ones and a handsome bright new brood; May 10th larva found on leaf of small thistle, pupated, imago emerged May 22nd Khanikin, Sept.-Oct., both old and new broods. Baiji on right bank of Tigris, common in worn states in March 1920; fresh bright ones later.

S. Kurdistan. Suleimanyeh, Sept. 1st. Jujar Nov. 22nd, a few seen.

This butterfly is widespread about the world.

GENUS POLYGONIA.

P. egea, Cr. Seitz., Vol. I, p. 1, 64 c.

Pale golden fulvous white marginal row of yellow spots above. Small white L shaped mark on underside of hindwing.

f. egea.

5 ♂, Karind Gorge, 13-17th July, 12th August 1918.
1 ♀, Mosul, 24th April 1919 (ex. Aldworth).
Taken on walls and rock facing the sun, about 4 p.m.

f. J. album.

2 ♂, Karind Gorge, 14-17th July 1918.
Capt. Riley remarks on these as follows:—
"The two forms are very distinct. It will be noticed that on 17th July 1918 both forms were caught flying together."

It may be of interest here to publish a note on the Central Asiatic forms of this genus which was made by M. Andre Avinoff whilst on a visit to the (British) museum shortly before the war. He says: "*Polygonia egea* (*triangulum*) is found in Europe; in the South, from Caucasus it begins to get darker and generally runs into the form of Central Asia. It is not the *interposita* of Staudinger, as the *interposita* is the *C. album* form with *some* character of *egea* (I saw the type and studied the form by the Turkistan material). Grum-Grshmailo gave the name *undina* (Rom. Mem. IV., p. 424) to the *egea* of Turkistan but he was not quite right on the distribution (all he says about Osh and Margelan). In reality *undina* goes to Chitral by Bokhara and flies together with *interposita*. The series of the British Museum contain both species (*egea* does not go on the South), *interposita* is darker in Chitral, Goorais, Thundiani (*cognata*) and brighter and less dark in the South Himalaya (Nepal, Sikkim to Ta-tsien-lu) (where it is) the *agnicula* (=*tibetana*, Elwes). The *interposita* is very near to *C. album*, but it may be a distinct species." A. Avinoff.

From this and the series in the B. M., and in fact from Staudinger's original description* it is evident that *interposita* has nothing to do with *egea* but is a good species or the central asiatic race of *C. album*. What has generally been known as *interposita* must in future go by the name *undina*, Gr. Gr.

"Vanessa (Grapta) *C. album* var. *interposita*, Stgr. Four specimens received from Ala Tan necessitate my setting up a var. *interposita*, to which I now add also the specimen from the Saison District and one from the Altai District (Ustkamenogorsk). The specimens have above as dark an outer marginal area as the North American form *faunus*, which name Strecker simply places as a synonym of *L. album*, which name, however, in spite of the presence of intermediates, might very well be maintained for this nearctic form. The underside of this central asiatic var. *interposita* resembles more the ab. (var. ?) *J. album* of *egea*, Cr. with the dark underside for which I at first took it. The C-mark especially is never so completely round or large as always in typical *C. album*, but forms a somewhat blunt angle as in *egea* or even only streak slightly bent below. Certainly this (mark) also varies in *C. album* and in all other Grapta species. In the North American *faunus* it is almost as bent as in *C. album*. *Egea* ab. *J. album* is however on the underside much more longitudinally streaked and above has never such a dark outer margin as has *interposita*. The *C. album* which are dark below are mostly brighter and in particular are without the brighter outer margin such as *interposita* shows. On this account these cannot either be referred to var. *faunus* all of which have a broader outer margin above, especially to the hind-wing. Since examples from Kashmir and India also have this, and also in the males the very round C-mark (the females have mostly only a dash) I refer them rather to *faunus* than to *interposita*. Two males from Margelan are very peculiar, one of them agrees completely with *interposita*, the other is above almost exactly as light as *egea* ab. *J. album*. Also below it (the latter) agrees almost completely with it in all respects and also the other specimen is just as much longitudinally streaked; the C-mark is reduced to a dash. These two examples belong more to *egea* than to *C. album*; but I refer them both to *interpostia*. Unfortunately I have no *C. album* from Amur or Japan before me."

* *Staudinger. Stell. Ent. Zell. 1881, p. 286.*

My own impression is that it is a good species. It is very much like *agnicula*, Moore, but has hind margin of the hindwing very broadly black, enclosing, usually, five very small pale spots—in *agnicula* these pale spots form a band—and the underside is somewhat, especially in the female, reminiscent of *egea*. The fact that with it in various parts of Kashmir *cognata* flies at the same time, and that *cognata* is pretty obviously a race of *C. album*, tends to support this view. Intergrades to *agnicula* occur, but not to *cognata*. The position in the Himalayas seems to be that there are three species, *viz.* :—

1. *P. egea undina*, Gr. Gr. Chitral, Hunza.
2. *P. C. album cognata*, Moore, Thundiani; Kulu; Nandar; Simla; Champur.
3. *P. interposita interposita*, Stgr. Chitral; Ladakh; Kylang; Kulu; Gervais; Pungi Dugi; Goolmerg; Gurwhal.

P. interposita agnicula, Moore, (=*tibetana* Elwes) Nepal; Sikkim; Tibet to Ta-sien-lu and Washan.

It may be well here to correct an error in Seitz. Macrolep, I., p. 208, with regard to the Japanese forms :—

Fentoni is not a synonym of *hamigera*. It is the older name for the form with the light brown underside ; *hamigera* being based on a specimen of the form with slightly narrower forewings and more melanic upperside, an extreme of the form in fact".

P. C. album, L. f. hutchisonni, Robson.

1 ♀, Karind Gorge, 12th August 1918.

GENUS LIBYTHEA.

L. celtis, Esp.

1 ♀, Karind Gorge, 16th July 1918, taken at small tree ; another seen.

Underside coloration of hindwing more uniformly grey than in European specimens ; more like some Chitral specimens.

PAPILIONIDÆ.

GENUS 1—PAPILIO.

KEY. *a.* Hindwing.—No central dark band ; a post-discal broad black band dusted with blue. Large terra-cotta red and blue tornal spot. Ground colour bright yellow. *machaon.*

b. Hindwing.—Two black bands traversing hindwing centrally. Ground colour yellowish white. *podalirius.*

P. machaon, L., ssp. **centralis,** Stgr.

19 ♂, 22 ♀ examined.

Capt. Riley notes :—"A variable series, but not separable from *centralis*, Stgr. On the whole the specimens are very pale in colour, more especially the bred specimens."

Expanse.—3·7 inches.

machaon in Mesopotamia averages larger than type and than the race from Mussoorie in the Western Himalayas, though perhaps not so large as some found in Sikkim.

Mesopotamia provides at least five food plants of *machaon*, three of them in great abundance, so that, with the vast extent of swamp in places somewhat like the Norfolk broads, and of plateaux, it is found commonly from near sea level by the rivers, to the highlands across the northern border. In early spring it is fond of cruising around the crests of stony hills or "jebels" and of settling at flowers or on the ground there. But it is most plentiful in May, about the banks and beds of the rivers and on the neighbouring plateaux where its food-plants abound. In April and May a low growing deep-yellow flowered rue is common on the table land at about 400 ft. elevation, the plant consisting mostly of the flower-sprays which grow to about a foot in height, each plant separately, but in groups forming yellow patches on the plateau. This plant was identified at Kew as *Ruta tuberculata*, Linne. The whole plant has an unpleasant smell, and, when picked or handled, leaves as intensely bitter substance on the fingers. It occurs less plentifully on the banks of the rivers. Larvæ were most easily to be found by searching plants growing at the margin of old trenches. They were conspicuous and, as with all *Papilio* larvæ, extruded the orange-coloured osmeterium emitting a strong 'Tom-cat' like odour when disturbed. The larvæ fed on the flowers. As this plant began to go to seed, an umbellifer, *Ammi majus*, Linne, came into flower; and on this eggs were laid by *machaon* singly on flower buds at the margin of young flower-clusters. This plant was common about moist patches and in hollows; and when young, is very slender, so that one saw a *machaon* repeatedly hovering about what at first appeared to be a grass-stem but on closer inspection proved to be an umbellifer. As this plant began to go to seed, another—identified at Kew as *Ducrosia anethifolia*, D. C.—which seemed to be local and not common, came into flower on the banks of the Dyala; the leaves being rather stiff and a little like split miniature palm-leaves. The whole plant is a yellowish green, flowers paler, and all parts having an aromatic parsley or carrotlike smell. It grows in clumps and singly about conglomerate rock.

Two larvæ only were found on this, both having remarkably white bands instead of yellowish or green ones, so that they were very conspicuous. While *A. majus* and this last mentioned plant were going over, a fourth food-plant, *Ammi visnaga*, Lam., had grown up among the first, especially in moist hollows on the banks and in the bed of the rivers and old canals. It is thick-stemmed, very erect, leaves made up of long filamentous branchings, the whole plant except the flowers being conspicuously deep green with compact umbrella like clusters of white flowers set more closely and uniformly together than those of *A. majus*; the pedicels being evenly arranged like numerous wires from the stem or stick of the umbrella.

This plant continued in abundance and conspicuously green when in the middle of June *A. majus* and others had mostly withered to dry sticks. The larvæ fed on the flowers of all these food plants and scarcely ever on the leaves though Lt.-Col. W. H. Evans informs me that at Murree he has bred *machaon* "on fennel-leaves not flowers."

Three of these food-plants grow in great abundance by the Dyala at about 400 feet elevation, where 34 larvæ almost full grown were easily obtained on *Ruta tuberculata* within an hour. The extensive grass-fires which occur on these plateaux in the hot months must destroy vast numbers of eggs, larvæ and pupæ of butterflies and moths.

A fifth food-plant an umbellifer, *Fœniculum vulgare*, Gærta, was noted on May 2nd, 1920, at Baiji, having with its clusters of orange yellow flowers some general resemblance to rue. On some of these, near which a bleached *machaon* was seen, eggs of machaon were found laid singly, some on the lower and outer-side of the pedicels of the flowers; some about the middle, others close up below the florets, and one on a filament of a leaf arising by a flower-cluster. The eggs were semi-opaque pale green and mostly with a broad reddish brown

band; spherical in shape, except where attached, and the surface seen under the microscope was only slightly rough. On 7th May a spiny black larva, with dull white medial patch and black head, hatched probably the previous day from one of the same batch of eggs was found on a floret of this plant. Moulted 10th May, becoming greenish white spotted with black with some lateral orange spots and slight spines, which were black except on segments 7 and 8, which still remained white. At this stage the larva was much less orange than those found at Kizil Robat the previous year.

On 12th May it again cast its skin becoming greenish white, banded transversely on each segment with orange and black spots, and with black intersegmental bands. It eventually reached full size being greenish white with transverse black band and orange spots. Towards the end it fed on the young seeds; on 19th May when wandering to pupate it fell into some water where it was found motionless and limp, apparently dead; but after being placed in the sun for about an hour it slowly revived, and pupated on 21st May, becoming a pale stone-brown pupa, but it died in this stage.

A pair were observed in copula on May 31st, one bright yellow, the other much paler and slightly smaller; the former was doing the flying. On the same date females were seen ovipositing, some on *A. majus* and others on *A. visnaga*, the two being in flower at the same spot. The egg, nearly round and like a shining semi-opaque pale-green bead, was laid at the base of a floret or on the leaflet by the side of a floret. The eggs were remarkably easily detached accidentally, as on handling the plant. On the same date, May 31st, eggs and larvæ in almost all stages were found on both *Ammi majus* and *A. visnaga*; and one larva on a spray of *Ruta tuberculata* growing there and still in flower.

The larvæ on the yellow-flowered rue had yellowish-green bands; the two on *D. anethifolia* had pure white bands as before mentioned and a few found on *A. majus* and *A. visnaga* on 31st May had very pale, nearly white, bands on each segment.

At Kizil Robat the very young larva was orange brown with a white portion medially. In early stages it has spine-like tubercles, which disappear later; and about the third moult the white median portion gives place to the orange-spotted black bands on the ground-colour as in other segments. The orange spots on these bands are of vivid colour.

When very small the larvæ lie along the stems of the pedicels of florets when at rest, but at all stages are fairly easily seen.

Larvæ were easily reared on sprays of *R. tuberculata* placed in bottles, the sprays and water being renewed twice daily. The escape of a few restless larvæ about to pupate warned one to put the larger larvæ together on sprays in one bottle with an old butterfly net placed over the sprays and larvæ and tied around the neck of the bottle; then any larvæ showing signs of diarrhœa or wandering could be detected and transferred each to an inverted glass tumbler in which a stem had been placed slantways; and on this the larvæ usually readily pupated, at first resting head upwards then turning head down while making the tail-pad of silk and again turning head upwards to make the body-girdle and to complete pupation, the larval skin being very rapidly thrown off after the moment of the first split in it being made. The pupating larva having made its silk pad and girdle, the stem to which it was attached was then removed from the tumbler and placed with others around a cork in a bottle to await the emergence of the butterfly in from ten to fifteen days time in the warm weather of May.

Pupæ varied in colour from grass-green studded with bright yellow tubercles of exactly the same shade as the flower-buds of the rue, these mostly producing females, to stone colour and some darkly marked brown, males generally emerging from these last.

Of four larvæ which temporarily escaped, one became a dust-coloured pupa on the rope lacing of the tent; a second turned to a green pupa at the side of

the back of a camp chair, matching exactly the colour of the Willesden-canvas to which it was attached. A day or so before the writer had noticed on leaning back in the chair the strong smell usually emitted by a *machaon* larva on being disturbed, but, on looking for it, did not see it then; a third pupated on a wooden box, here again matching the colour of the wood; while the fourth, on the camp-bed being set up again, after having been folded up in its case and moved with other kit on a cart from the last camp, was found attached undamaged to the iron cross-piece of the bed.

Circumstances prevented the completion of experiments with *A. majus* and *A. visnaga*, and the larvæ on these had to be liberated. The emergence from the pupa and wonderful, rapid, expansion of its wings was an ever-fascinating process to watch. It took place often about 5 a.m. (in June) and emergence was so rapid that one rarely witnessed the formation of the first crack in the pupa-case.

A small black parasitic fly infests this species, scores of its pupæ being found in each of several pupæ found in the open attached to plants, whereas very few pupæ reared from larvæ taken nearly fully grown were thus infested. One pupa was found on the stem of *A. majus* about three feet above the ground; another on the stem of a yellow composite flower scented like lavender. To capture the free butterfly the net should be dropped over it as it is settled or hovering, the tail of the net being held up, as a side sweep is very apt to damage the wings or tails, especially among the sharp-spined yellow thistles so attractive to butterflies. Like all swallow-tails it is very apt to damage itself in the net if not quickly killed.

machaon was often to be found in the spring at the top of stony hill-crests and, when first put up, usually cruised around for a bit but settled eventually at a flower or on the bare ground in the sunshine at the highest spot, to be secured by dropping the net over it after a cautious approach. As mentioned before, it is often found associated with *Melitæa didyma* and a *Synchlœ belemia* or *Euchlœ* on the hill tops—*Melitæa* settled on the ground and *Synchlœ* merely hurrying past. In May it is remarkably common on the banks of the Dyala and many may be taken in a short time especially between 9 and 10 in the morning. But the best specimens are of course obtained by rearing from the larvæ, the largest larvæ being taken to ensure early pupation. On the banks of the Dyala at the end of May many of these butterflies are worn and bleached.

Localities:—Kut-el-Amara: Kotamiyeh forest near Azizieh (Major Broughton); Baghdad and Mosul (Lt.-Col. Watney); Kizil Robat by the Dyala, Baiji and up to 6,000 feet at Karind in N. W. Persia.

The following notes regarding larvæ and periods of pupal stage may be of interest. Many more larvæ pupated and emergence duly took place, but date of pupation was not always noted.

Larvæ were common on April 15th, and one was found on June 23rd.

The dates of pupation and emergence were noted in the following instances:—

Pupated.	*Emerged.*	*Period in days.*	*Sex.*
April 18	April 28	10	♂
,, 21	May 1	10	♀
,, 22	,, 2	10	♂
,, 23	,, 5	12	♀
,, 23	,, 5	12	♂
,, 24	,, 6	12	♀
,, 24	,, 8	14	♂
,, 25	,, 9	14	♀
,, 27	,, 10	13	♀
May 22	,, 31	9	♀
,, 22	June 1	10	♂
,, 27	,, 6	10	♀

P. podalirius, L. Seitz. Vol. 1·7 c.

Much paler yellow than *machaon*. 2 black bands from costa to dorsum of forewing. 1 black band trave sing hindwing centrally to anal eyespot: tail long and straight continuation of hindwing.

Two specimens of this were taken by Capt. Aldworth and Capt. Marshall at 5,000 ft. at Suwarra above Mosul in the first half of July.

The fact that oak, plum and other fruit-trees are food-plants of this butterfly explain its being found in the hills and not on the plain.

The larva is thick, narrowed posteriorly, green with many dark spots and oblique yellow lateral lines.

P. alexanor, E. Seitz. Vol. 1.7a is likely to occur in the highlands. It has a continuous yellow marginal band on forewing, a distinct black elongated discoidal spot on hindwing and the antennæ tipped with yellow.

Kane says its food-plants are "Seseli montanum and other umbellifers."

GENUS 2.—THAIS, Hb.

T. cerisyi, Bdv. Sub.-sp. **deyrollei,** Ol. Seitz. Vol. 1. 9d.

KEY: Hindwing, interrupted dentations along terminal margin, three on each h.w. lengthened into tails.

Antennæ short.

Upperside:—f. wing:—ground colour very pale yellow with broad black patches along costa; dark shadings at apex and terminal margin.

Hindwing:—Interrupted dentation along terminal margin, and three on each wing lengthened into tails. A median series of small red spots and one larger costal one ringed with black.

Expanse:—just over 2 inches.

One, of large numbers seen migrating over open ground at Mosul at end of April or early May, was taken by Capt. T. Aldworth, and sent to the British Museum of Nat. History and there identified as this race of *T. cerisyi* "having 3 fairly well developed tails to each hindwing," one recorded also from Tekrit by Stoneham.

The larva is stout, dark, but varying much in colour, with numerous tubercles as in *machaon*, and 4 broad yellow longitudinal lines; food-plant *Aristolochia*.

GENUS 3.—DORITIS, Fabr.

D. apollinus, Herbst, Seitz. I·10c.

On the forewing rather densely pencilled transversely on a grey ground, the ♂ being occasionally marked with a little red; hindwing chalky white in fresh specimens, yellowish in worn ones, the dark border bearing reddish spots centred with blue. ♀ darker, stouter, pencilled also on the hindwing, here and there irrorated with red. Western and South Western districts of Asia Minor, transitional forms also in Syria and Mesopotamia.

Two specimens were sent to the Society, taken by Lieut.-Col. Watney about 25 miles N. E. of Mosul at 1,000 feet where they were fairly common in fields in April 1920.

(*To be continued.*)

THREE NEW ALPINE ORTHOPTERA FROM CENTRAL ASIA.

By

B. P. UVAROV, F.E.S.

That the entirely unexplored Alpine Orthopteran fauna of the great mountainous systems of the Central Asia (Kashmir, Tibet, etc.), includes many unknown and even unexpected forms, is evidenced by the fact of my discovery of three very peculiar new genera and species of these insects in the British Museum collection where the Central Asiatic Orthoptera are represented by only a few casual specimens. I hope, therefore, that the entomologists who have the chance of collecting in those countries, will pay more attention to grasshoppers, locusts, crickets and mantids, which are usually neglected as being "uninteresting". In fact, the collecting and preserving (in paper packets, or amongst layers of cotton-wool) of these insects is very easy and takes but very little time and trouble, and the results are always very gratifying. The author should be very glad to get for identification all collections of Orthoptera from Central Asia, those from high mountains and from deserts* being the most interesting; the collections may be sent to the British Museum (Natural History), London, Cromwell Road, S. W. 7, and will be promptly worked out and returned, except the types of new forms and duplicates wanted for the Museum.

The types and paratypes of the insects described in this paper are in the British Museum collection.

Sub-family: *Locustidæ*.

1. *Orinhippus*, gen. nov.

♀. Resembling somewhat in its habitus to *Sphingonotus* but with very small, lateral elytra and wings. Antennæ sub-equal to the head and pronotum together, very slightly widened apically; their bases are scarcely above the line connecting the lower edges of the eyes. Head not thicker than the pronotum in its fore part; face somewhat reclinate; frontal ridge distinctly prominent, coarsely rugose, with its margins raised, feebly divergent from fastigium towards the middle ocellum, suddenly and strongly constricted below it, then subparallel but less distant than above the ocellum; fastigium of the vertex sloping, forming an obtuse but not rounded angle with the frontal ridge, longer than it is broad, with the surface impressed; temporal foveolæ very small, irregular; occiput globose, short; eyes slightly prominent sideways but not at all upwards, short-oval, scarcely higher than long. Pronotum on the same level as the head, distinctly narrowed anteriorly but without any constriction (*i.e.*, conical); its disc feebly convex; median keel linear, interrupted by two transverse sulci; the second (typical) sulcus placed about the middle of the pronotum; lateral keels slightly indicated by the small elongate ridges at the fore margin, not reaching the first sulcus; fore margin straight; hind margin very widely rounded; lateral lobes a little higher than long, narrowed downwards; their fore angle obtuse; lower margin nearly straight, oblique; hind angle obliquely truncate; hind margin oblique, slightly excavate. Prosternum somewhat incrassate. Mesosternal lobes distinctly transverse, with inner margins and hind angles rounded;

* As far as I know *not a single specimen* of Orthoptera from the Indian Desert, for instance, reached the hands of a specialist, and our knowledge of the fauna of Baluchistan, Afghanistan a. o. is worse than fragmentary.

mesosternal interspace about one half again as broad as one of the lobes. Metasternal interspace sub-equal in width to one of the mesosternal lobes. Elytra perfectly lateral, lance-shaped, extending a little beyond the hind margin of the metanotum ; wings shorter than elytra. Tympanal organ open, but the tympanum seems to be not membranaceous, and the organ is probably not functioning. Abdomen distinctly conical, because the mesonotum, metanotum and the first abdominal tergite are thickened ; a linear median keel runs all through the abdominal tergites, gradually lowering backwards. Fore and middle legs short. Hind femora not reaching the apex of the abdomen, moderately thickened basally and gradually narrowed apically. Hind tibiæ with nine outer and eleven inner spines, without an outer subapical spine ; apical spurs short. Valvæ of the ovipositor short, rather thick, recurved apically ; the lower ones with obtuse teeth.

Genotype : *Orinhippus tibetanus*, sp. n.

Orinhippus tibetanus, sp. n.

♀. Greyish-ochraceous (has been preserved in spirit), with greyish and brownish dots. Face rugulose and spotted with brownish. Antennæ with alternate pale and brownish rings. Fastigium and occiput spotted with brownish. Pronotum in the prosona rugulose, with brownish spots, in the metazona densely punctured, ochraceous ; hind margin with brownish streaks along it. Elytra of the general coloration, with indefinite greyish spots. Legs darker than the body, marmorated and fasciated by brown. Hind femora with two feeble dark fasciæ on the upside, and with two still more indistinct oblique fasciæ on the outer side ; the second (subapical) upper fascia extends also in on the inner side where it is somewhat better expressed ; the knees are brownish all over, with the lobes paler, brown-spotted. Hind tibiæ pale with the base, a fascia before the middle and the apical fourth part, brownish ; spines and spurs with brown apices. Length of body 18 mm. ; pronotum 4 mm. ; elytra 2·5 mm. ; hind femora 9 mm.

Described by a female from Gyangtse, 13,000 feet, June, 1904, Tibet Expedition, H. J. Walton ; three paratypic females are from the same locality.

The insect is somewhat alike in its habitus to a *Sphingonotus*, but it lacks the most characteristic feature of that genus—the constriction of the pronotum ; the undeveloped elytra and thickened mesonotum and metanotum give it an altogether peculiar appearance. Though the specimens are all rather discolored by the spirit, it seems that their coloration when living has been essentially the same as it is now.

2. *Dicranophyma*, gen. nov.

♂. Resembling in its habitus to the New Zealandian genus *Paprides*, Hutt, and the Indian *Pileolum*, Bol.

Antennæ somewhat compressed, a little longer than the head and pronotum together. Head not prominent above the pronotum and not thicker than that. Face strongly oblique ; frontal ridge elevated, in profile almost straight, flat, with a feeble impression below the ocellum, with the margins straight, feebly divergent downwards, very obtuse but nearly reaching the clypeus. Fastigium of the vertex forming distinct angle with frontal ridge, distinctly prominent before the eyes, but slightly shorter than broad, obtusely triangular ; its surface very slightly impressed, with somewhat raised margins and with a low median carinula, which begins from the apex, but disappears in the occiput ; vertex between the eyes twice as broad as the frontal ridge between antennæ. Eyes irregularly oval, their vertical diameter exceeding the horizontal one by about one-third of the latter ; hind margin strongly rounded ; fore margin almost straight ; both upper and lower angles subacute. Pronotum above flattened ; median keel low, but very distinct, straight in profile, cut by the typical sulcus ;

prozona about twice as long as metazona ; lateral keels irregular owing to some impressions alongside them, but quite distinct throughout (only in metazona somewhat obliterate), interrupted by two sulci ; fore margin of the disc slightly convex ; hind margin deeply angularly excised, the margins of the emargination distinctly convex ; lateral lobes distinctly longer than high, narrowed downwards distinctly inflated in the upper part of the prozona ; their fore margin convex ; fore angle widely rounded ; lower margin rotundato-angulate in the middle ; hind angle very obtuse and widely rounded ; hind margin very oblique and slightly concave. Prosternal tubercle transverse, with two conical apices directed obliquely outwards. Mesosternal lobes distinctly broader than long, with inner angles rounded ; mesosternal interspace a little broader than long, distinctly widened backwards. Metasternal lobes distinctly separated. Elytra lateral, oval, coriaceous, with only two longitudinal veins, while all other veins and veinlets are obliterate. Wings not developed. Tympanum large, open. Mesonotum, metanotum and abdomen with a low median keel. The last abdominal segment with two teeth. Supraanal plate triangular. Cerci shorter than supraanal plate, laterally compressed, triangular. Subgenital plate small, compressed laterally, with the apex conical, somewhat recurved. Fore and middle femora short, distinctly incrassate. Hind femora somewhat incrassate, but only feebly dilated, extending well beyond the apex of the abdomen. Hind tibiæ rounded, distinctly incrassate apically, armed with eight spines both inwardly and outwardly, without an outer apical spine ; inner spurs are longer than the outer ones ; the outer lower spur is the smallest of all.

Genotype : *Dicranophyma hingstoni*, sp. n.

Dicranophyma hingstoni, sp. n.

♂. Olivaceous, moderately rugose. Face greenish-grey, smooth ; frontal ridge sparsely, but rather coarsely punctured ; the sides of the fastigium, between the cases of antennæ, eyes and lateral margins of frontal ridge, black ; head from above with indefinite brownish fasciæ ; postocular fasciæ black, narrowed posteriorly. Pronotum with the disc olivaceous, dull, but the keels and raised rigdes are shining ; prozona with but few, rather indistinct, though large, impressions ; metazona rugulose ; lateral lobes of a lighter shade than the disc, shining, in metazona somewhat rugulose ; prozona with two oval impressions just below the lateral keels, below the impressions inflated, with large oblique black spot touching the lateral keels between the sulci and extending a little beyond the hind sulcus. Metanotum and first tergite with irregular longitudinal rugosities, olivaceous and dull on the upper side, black and shining laterally ; the upper part of mesopleuræ and metapleuræ shining black, the lower yellowish green. Abdomen dull olivaceous from above, muddy yellow from beneath, with the sides of 2-5 segments reddish. The teeth of the last abdominal segment triangular, broadly separated ; supraanal plate longer than broad ; its basal half with a shallow median impression and two indistinct lateral impressions. Fore and middle legs olivaceous. Hind femora olivaceous, with an yellowish ring before the knee which is black all over ; the inner and lower sides are reddish. Hind tibiæ red, with the very base black and with a post-basal yellowish ring ; the tips of spines brown. Hind tarsi reddish olivaceous.

Length of the body 17 mms ; pronotum 4 mm. ; elytra 4 mm. ; hind femora 10 mm.

The type is unique ; it has been captured (13-9-1913) by that enthusiastic explorer of Kashmir, Capt. R. W. G. Hingston, in the Astor District, 9,000 feet, and I am greatly pleased to have the opportunity of naming such an interesting insect after him.

It is not easy to find a proper place in the system for this insect and the above mentioned New Zealandian genus *Paprides* and Indian *Pileolum* seem to be its nearest, though by no means close, relatives. There are now three Central Asiatic Alpine wingless genera, belonging to the group *Catantopinæ* (*Acridiinæ*): *Conophyma*, Zub., *Paraconophyma*, Uvar.* and *Dicranophyma*, Uvar., and the last named is easily distinguished from two others because it belongs to the different section, without an outer apical spine on the hind tibiæ.

Sub-family: *Tettigoniidæ*.

3. *Hyphinomos*, gen. nov.

♀. Related to the Palearctic genera *Amphiestris* and *Onconotus* but strongly differing from both in a number of characters.

Antennæ longer than the body, setaceous, with rather dense short hairs; first joint thickened. Head short and thick, globose. Face vertical, convex, very broad, smooth. Fastigium of the vertex produced in the shape of a truncate tubercle, shallowly sulcate. Eyes small, but very prominent, perfectly round; their lower margins on the same line with the bases of the antennæ. Occiput broad, globose, smooth. Pronotum distinctly broader than long; rugose: its disc scarcely convex near the fore margin, feebly, but distinctly, impressed behind the middle, with the hind margin slightly ascendent; one feeble transverse sulcus at the end of the fore fourth of the disc; fore margin slightly concave; hind margin straight; all keels absent; lateral lobes very uneven, strongly rugose, with lower margins raised and a rather deep sub-marginal impression, the bottom of which is finely longitudinally rugulose; hind part of lobes forming a straight, though widely rounded angle with the surface of the disc; general form of the lobes elongato-triangular, the fore margin being straight and slightly oblique, fore angle obtuse, rounded, lower margin in its fore part convex, then ascending obliquely to the shoulder, so that there is no separate hind margin. Prosternum with two small, obtuse widely separated tubercles. Mesosternum and metasternum transverse, thickened, without separated lobes. Elytra lateral, round. Cerci short, conical. Subgenital plate rather thick, transverse, slightly emarginate at the apex. Ovipositor thick, broad, feebly recurved in the apical third, with the disc longitudinally rugulose towards the apex. Fore coxæ armed with a strong, somewhat decurved spine. Fore femora short, rather thick, not armed. Fore tibiæ thick, somewhat constricted in the middle, armed with an outer upper subapical spine and with six strong spines on each side of the lower side. Middle legs armed as the fore legs. Hind femora only twice as long as the middle femora, not reaching the apex of the abdomen (if the latter is not contracted); their basal half feebly incrassate; the apical half bearing 8-10 spinules along each of the lower carinæ. Hind tibiæ thick, slightly decurved; all their keels obtuse, except the inner upper one, which is distinctly raised, rather sharp and armed with about 10 spinules; outer upper keel with about 8-10 small spinules; the lower side with 4 inner and about 7 outer longer spines; two pairs of short spurs, the lower pair being shorter than the upper one. All tarsi depressed, strongly bisulcate; hind tarsi without moveable plantulæ.

Genotype: *Hyphinomos fasciata*, sp. n.

Hyphinomos fasciata, sp. n.

♀. Head smooth, sparsely and finely punctured in the middle of the face and with two irregular rows of punctures on the occiput; face whitish, with a black transverse fascia along the upper margin of the clypeus; another shining black fascia runs across the bases of antennæ, apex of the fastigium and eyes.

* Ann. Mag. Nat. History, Ser. I, vol. VII, p. 497, 1921.

reaching the pronotum and widening behind the eyes. Antennæ black. Pronotum reddish-brown ; lateral lobes margined with black. Mesopleuræ, metapleuræ and all coxæ on their upper side black. Abdomen smooth, brown. Elytra reddish-ochraceous. All legs brownish-olivaceous ; hind femora with the base of the inner side and the lower sulcus black. Ovipositor brownish, with the upper margin black.

Length of body 22 mm., pronotum 5 mm. ; elytra 2 mm. ; hind femora 11 mm. ; ovipositor 12 mm.

Described from three females (type and two paratypes) from Dakar, Western Tibet, 15,000—16,000 feet. 23rd August 1905. T. G. Longstaff.

This is a very peculiar insect, occupying a rather isolated position amongst its relatives, which are the Western Mediterranean genus *Amphiestris* and the Siberian *Onconotus*. The male is unfortunately unknown, but there is no doubt that it has the elytra more developed than the female, and transformed completely into a sounding apparatus ; it is not impossible that its pronotum is also modified. I do not know any other records of Orthoptera from such an extraordinary high altitude as this one.

A FEW HINTS ON CROCODILE SHOOTING.

BY

W. H. O. Shortt.

(With two plates and a diagram.)

I have been asked by our Honorary Secretary to write a short article entitled "A few hints on crocodile shooting."

I think it best to give a short summary of how to carry out a crocodile shoot, so that a complete novice may know what to do, and an older hand, may, perhaps, pick up one or two useful tips.

With me the pen is certainly not mightier than the sword, but I will do my best and trust to the leniency of my readers. This is not meant to be a literary masterpiece, but merely a few practical remarks strung together. To start with I will explain the outfit required for a shoot of a few days, as I presume you will not go for a single day only, and even then the outfit would be much the same. You will probably have to camp out when indulging in this sport, but that is a pleasure in the cold weather. The outfit I give includes no camping out articles, as that is a matter that does not concern this article.

OUTFIT AND PERSONNEL REQUIRED FOR A CROCODILE SHOOT.

Articles.	*Personnel.*
1 Pair Binoculars.	1 Overseer.
1 Rifle.	1 Harpooner.
1 Rifle rest.	1 Axeman.
1 Gun.	2 Boatmen.
1 Axe (4 lbs.).	6 Chamaars.
4 Harpoons complete.	
80 Feet $\frac{3}{4}''$ diam. rope.	
1 Light boat.	
1 Pole.	
1 Paddle.	
100 Feet tow line $\frac{1}{2}''$ diam.	
6 Skinning knives.	
1 Sharpening board or stone.	
1 Good file.	
1 Ten foot bamboo for carrying skins.	
1 Tape measure.	
1 Set of maps.	
1 Ball twine.	
1 Sack needle.	
12 Sacks or gunny cloth.	
Salt, say three maunds.	

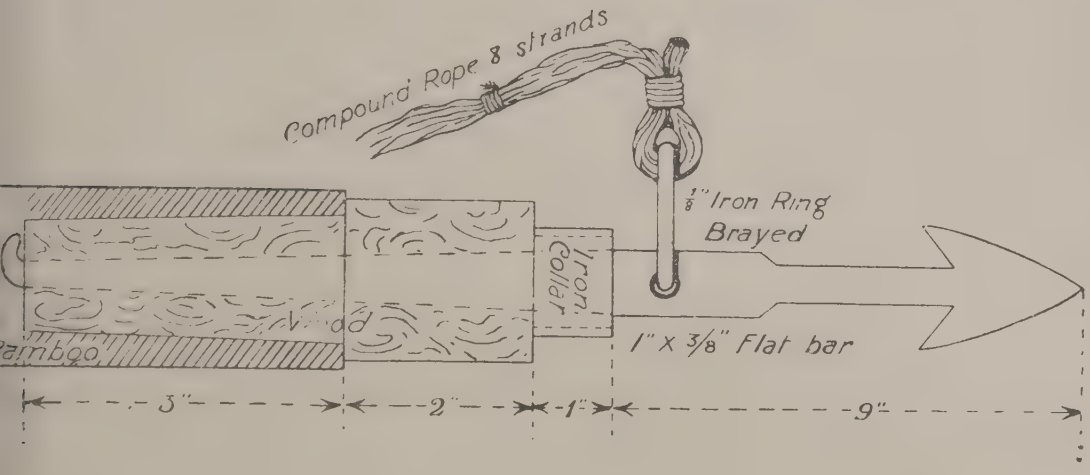
You want a very hard hitting rifle with a low trajectory, such as a Ross, which, unfortunately, is not now obtainable. Westly Richards make a rifle which I think is ·318 bore ; this ought to be good according to the specification. If you can afford to do so, get your rifle fitted with a telescopic sight, as in no branch of shooting have you to be more accurate than in crocodile shooting. Another

A heavy Mugger (*C. palustris*).

Getting out a heavy Mugger (*C. palustris*).

HINTS ON CROCODILE SHOOTING.

rifle which has the qualifications of being cheap and nasty but very accurate and hard hitting is the ·405 Winchester magazine rifle. This has an under lever action which is very bad, as you do a good deal of your shooting lying down and in that position you cannot conveniently open and close the breach, but with this rifle, if you get a well placed shot in, you seldom require another.



The harpoon is a somewhat complicated affair. It consists of three main parts : (*a*) a shaft twelve to fifteen feet long, bound with wire at the thick end to prevent it splitting ; (*b*) ten feet of stout cord about $\frac{1}{3}$ inch diameter, fastened to the shaft and about 8 strands of $\frac{1}{8}$ inch diameter cord 15 feet long each, attached to the loose end of the thick cord, the other ends being attached to the harpoon ring. This is to prevent the animal cutting the cord near to the harpoon, as occasionally happens if a single thick cord is used. These thin cords should be bound together, at about 18 inches interval to avoid getting them entangled ; (*c*) a barbed head with wide deep barbs made from $\frac{5}{8}$ inch bar iron or 1 inch by $\frac{3}{8}$ inch flat iron, fitted into a wooden collar, and the end turned over to prevent it being pulled out. The sketch of the harpoon explains things better than words. This barbed head must always be kept sharp, and the point should be fairly obtuse so as not to get bent by striking against a hard part of the animal.

This outfit is for a one man show. If there are two or more of a party, it is advisable for one to go on each side of the river, in which case you want an extra harpooner and axeman, if you would save time.

The best time to plan your shoot is between December and February, before the hot weather begins. During these three months, besides being cool, snow-fed rivers such as the Kosi and its tributaries are at their lowest ebb, and the crocodiles have numerous banks to bask on. It is cold in the mornings and evenings, and warm all day, with the result that the animals are out from about 9 a.m. to 4 p.m. You don't need to get up before sunrise. You get up at a respectable hour, have your breakfast comfortably and then sally forth just in time to get the early crocs. As it gets hotter the animals come up earlier and earlier, and stay later and later, until when the weather gets really hot during the day they come up about sunrise and then go down again about 10 a.m., coming up

again about 4 or 5 p.m. and staying till dark, or sometimes till after dark. Very big animal occasionally come and bask at night during the hot weather.

When you have fixed your dates for shooting, get your outfit ready and engage a shikarri. Tell him to first obtain full details of road and river communication, especially in the Kosi district, and then to locate the favourite sandbanks of the crocodiles. Get these fixed on your map as accurately as possible by getting their direction from the nearest villages. Do not on any account trust to your shikarri's ideas of distances, as he will cheerfully call five miles a *kos* or two miles. Having done this, engage your personnel and boat and fix your route roughly. I say roughly on purpose, because local or climatic conditions may force you to alter your plans. When you go crocodile shooting, wear breeches, as otherwise crawling about or going on all fours will be found painful to your knees. Breeches also save you from getting sun scorched if you are not accustomed to wearing shorts, especially if you are in a boat. A dark khaki shirt and ordinary pigsticker topie complete your outfit ; if you want to do it in style, add a pair of rubber soled shoes or boots to your kit. These are very useful when stalking, as, besides being noiseless they do not break dry twigs so readily as ordinary boots. Crocodiles are extremely keen of hearing and very sharp sighted, so one has to be careful to keep out of sight of them, and to avoid treading on dry twigs or grass if possible. In localities where people are constantly coming and going, such as near ghats, they become quite bold, and you can frequently walk up to a point opposite them on the other bank, sit down comfortably and pot one of them at your leisure.

This, of course, is only possible when the river is narrow enough to shoot across.

If you are shooting along a river and travelling in a boat in preference to foot-slogging it along the banks, always follow the outside curve of a bend in the river, and keep close to the bank, as this enables you to see farthest head, and also makes it easier to disembark quickly, as frequently one comes across an animal that is not visible till you approach quite close to it, and if you have then to come in from somewhere about midstream, and happen to be going down current as well, you are on to the animal before you can come ashore.

This is obviated by sending scouts well ahead, one on each bank, to warn you.

When you arrive in the vicinity of the first bank, go forward and from a distance examine the plan and the animals carefully with your binoculars, select your animal and the best place to shoot it from.

You will usually find that a short snouter, if on the opposite bank, is bolder than a long snouter, and may be more easily approached, but if on the same side of the river as yourself, the long-snouter is the bolder. If you have to stalk for position, walk up till you can, just see them from a crouching position, and then drop on all fours. If your glasses are in a sling case, you had better discard them here, as they will impede you and are apt to disturb the animals by bumping against your knees. For some reason or other a crocodile does not seem to object to your approaching on all fours nearly as much as if walking. You can frequently get to within 80 or 100 yards of them over absolutely open country if you go on all fours. When you have gone as near as possible like this, lie down flat and imagine you are a worm and crawl as close as you can under cover. Going like this you require very little, or low cover. A few sprigs, blades of corn in the puggari of your helmet are a great assistance in stalking. I may remark here, that it is advisable to have a foresight protector of a kind that closes the muzzle of your rifle and prevents it getting filled with sand or mud for this sort of stalking, as otherwise sand is bound to get in and then you have to clean it out. All this means unnecessary movements on your part, which you wish to avoid. When you have got as near as possible, slowly erect your rifle rest, which should be adjustable. I use a pointed stick with nails driven in three inches apart. If you are a humane person, don't shoot without the

rest, as you have really a very small target to aim at. It is quite easy to hit your animal, but unless you hit him in the right place, he will merely slip into the water and be lost, wounded.

An animal of 7 to 8 feet in length *may* be knocked out by a heavy bullet through the body, but above that length, unless you smash the spine, which is not usual, it is quite useless to take a body shot and expect to stop the animal. You *must* get him on the neck, between the jaw and shoulder. Even this target is limited. Divide this part horizontally, into four equal divisions. You must get your bullet into the middle two divisions if you want to stop your animal till you can harpoon him. You *may* manage to harpoon him if he is hit above or below this, but it is doubtful. There is one other spot to hit him. If you know your rifle and can hit the mark, the upper quarter of the head, horizontally, is a very deadly shot, as you usually blow out the animals brains, but it is also a very difficult shot. I have seen an animal go away with two bullets in his head. One got him behind the eye in the upper jaw, but below the brain line, and remained inside, and the other took a piece of the top of his head off, without smashing his brain. These were ·405 bore Winchester bullets, and anybody who knows that make of rifle, will have some idea of what a big crocodile can stand.

Before starting to stalk your animal, place your harpooner. He should be as close to the animal as he can approach without fear of disturbing it. On a still day he ought to be about 40 or 50 yards off, but if a good wind is causing a rustle in the grass or scrub, he may approach closer. As soon as you fire he will rush down and harpoon the animal, near the head for choice, and from behind. This prevents the animal seizing the harpoon, and the man in charge can then, with a little trouble, free the head of the harpoon from the shaft and wrap the cord round the animal's snout three or four times. This prevents him snapping, and while the harpoon holds the snout in one direction, the axeman severs its spinal column from the opposite side. Because you may happen to have absolutely laid out the animal with your rifle, unless it has been the brain shot, don't neglect the axe and leave the crocodile, because he almost certainly is not dead, and if you left him for an hour and came back, it is quite possible you would not find him. He will have recovered a little and struggled into the water. Once his spinal column is severed, he is safe. If you have not the axe handy, put a charge of No. 4 shot into his brain from about three feet away. If you are after a short snouter you cannot wind the cord round his snout owing to the shape, therefore, if he is of any size, always take a gun with you, and as soon as he is harpooned, if he shows the least sign of life, put a charge of No. 4 into his head from 2 feet away. He has a much thicker skull than the long snouter. If he appears quite dead, or at all events, quiescent, seize him by the tail and hind legs and drag him ashore, and then apply the axe. A short snouter is very much harder to kill than a long snouter, and both, if alive, are very dangerous when harpooned, so whatever you do, keep out of range of their jaws. The neck shot, properly placed, and not too near the foreleg, will usually stop a short snouter long enough to harpoon him, but you can never be sure. They have enormously thick, muscular necks, and they will often get into the water without being harpooned, no matter where they are hit, as they usually lie very close to the water, and almost invariably, where there are short snouters of any size, there you will find very deep water, and deep close to the edge. The shot will usually kill him eventually, but even if you get him a few days later when he floats up, his skin is useless.

As soon as you have hit an animal, and stopped it, if it is in such a position that the harpooner will take some time in reaching it, say over 20 seconds, which will frequently be the case from some cause or another, get your glasses and examine him again to see exactly where you have hit him. You will see the blood oozing out of the bullet hole. If he is hit outside the deadly zone, the

probability is that he is only temporarily stunned, and will recover very quickly and slip into the water. In this case, put another bullet into him. He occasionally recovers so quickly, in spite of a second bullet that you are inclined to believe that the second shot acts as a sort of counter irritant, and in some cases, though not usually, I think it does. Once a wounded animal starts wriggling towards the water, my experience is that you may put as many bullets as you can into him, but you won't stop him reaching the water. I suppose the reason is that you have only time, at the most, for two more hurried shots and neither of them strikes within the deadly zone.

If a heavy animal gets into the water after being harpooned, don't try too hard to hold him by the harpoon cord. It is not meant to drag him ashore with. Rather let the harpoon go altogether; when the animal gets into the water, its movements will soon shake the head clear of the shaft, the cord will unwind, and the shaft float to the top. Now follow up in your boat and keep your feet clear of the cord. Pull up the animal to the surface with the cord and get another harpoon into him, or another bullet or charge of shot. You will very seldom have to do this if you use a good rifle and are a decent shot.

As soon as you have your animal killed, get your thick rope round his snout or head, according to class of animal, and pull him well away from the water's edge, out of sight of it, if possible, as his carcase is apt to deter others from coming up in the same place.

Now your chamars can get to work. Don't stay behind with them. Leave two or three chamars, according to the size of the animal, to skin it, and take the rest on. You want as many men as possible with you, as it will take a dozen good men to pull a heavy animal up a steep bank. You will frequently have to get help from the people round about for this job.

If shooting on a fairly narrow stream, say one varying from 50 to 120 yards across, you will generally shoot from across the river. If you hit an animal and stop him for a short time, though not long enough to harpoon him, don't give him up as lost. Twice out of five times he will come up near your bank, just about opposite where you hit him, in about ten minutes or less. The water gets into his body from the bullet wound and interferes with his breathing. The larger the hole made the sooner he comes up. He will probably first rise some distance out, but have patience, he will probably come right into the bank. Keep under cover, and when he comes up, creep up as close as possible, he probably won't be hard to approach fairly close to, and give him a bullet through the head. In a wide stream, he will probably come up a little lower down on the same side as he was on when hit.

Occasionally you will shoot an animal that is in the water, near the edge. If you have got in a deadly shot, he will probably struggle and lash about but will not leave the immediate vicinity. He will almost certainly turn on his back and his tail or legs will show above water. He will gradually sink and the current will take him into deeper water. In this case, if you have not succeeded in harpooning him first, get your boat up as quickly as possible, when your harpooner will feel all over the bottom of the river near where it sank, with the harpoon. When he finds it, if he does, he will endeavour to stick the harpoon into it. This done, you can pull him up with the harpoon. If it is in pretty deep water, he probably will not be able to get enough power into the stab to drive the harpoon into the animal, especially if it happens to be a short snouter's back (his head, of course, is quite hopeless). In this case place the harpoon head, as well as you can judge, on the animal's back, and then use your axe head as a hammer, and drive the harpoon in as if it was a pile. If a wounded animal turns upside down, it is usually quite safe to rush in and seize him by a hind leg or the tail. He has not enough life in him to do any damage. You must expect to lose a big percentage of animals shot in the water, as they are usually near deep water, and unless found very quickly, the current carries them away. Never shoot at an

A Female Gavial (*G. gangeticus*).

Male Gavial showing nob at the top.

animal that is swimming about in deep water, as it is quite impossible to recover it, you only disturb the other animals, besides being unsportsmanlike to kill wantonly. When swimming about, they present a very difficult target, as you only see the top of the head and snout. This gives you a horizontal target about two inches deep, if a large animal, to get your bullet into. If you alone are shooting, tell your harpooner, or whoever you have on the opposite side, to keep a sharp look out for animals basking on your side, especially if the banks are steep or vertical. As soon as he sees one, he signs to you and then goes and stands opposite the animal, well away from the edge, with his harpoon shaft pointing straight at the animal. Then you go up and get in line. He now signals which way the animal's head is. Creep up from behind and try and get as nearly as possible over him, and put a bullet through his brain. The rifle rest is no use here. Usually, just as you catch sight of them, or probably just before, there will be a frantic splash and you may just see the tail disappear under water. Occasionally you will bag one this way, and then the satisfaction more than makes up for your other disappointments.

You will very seldom catch a big animal like this. A wind helps you a great deal in this sort of work, as the rustling of the leaves and grasses deadens any slight noise you may make. Rubber shoes come in handy here. If you are wearing heavy boots, you had better take them off when you come near the animal, and go in your stockinged soles. Have a harpooner handy, because stalking of this sort is usually done in a river with steep banks, and the water is probably deep at the edge, or gets deep very quickly, and you want to harpoon your animal while he is struggling at the top.

If you happen to know a place where the crocodiles are used to frequenting shallows or submerged sandbanks, and they are not visible when you arrive on the scene, the procedure to adopt is as follows:— Fix up your rifle rest in a suitable spot and get ready. Then give some one the signal to fire a shot into the water. A rifle shot is best, but a gun will usually do the trick. Crocodiles are gifted with curiosity, and almost at once you will see their heads come up to see what is going on. Now select one over a shallow part, preferably one looking away from you, and shoot him through the head. A good maxim when shooting crocodiles is never to fire at a crocodile with only one cartridge in the rifle. You never know when you may require a second or third shot in a hurry. Even if you have cartridges with you, you will almost certainly have to expose yourself in reloading. With a wounded animal this does not much matter, but now and again, especially if there is a strong wind blowing, and there are several animals up, all will not bolt at the first shot, but if you expose yourself immediately after, they certainly will.

Although you have a gun with you, don't shoot birds while after crocs, as you only disturb the animals and make them shy. Shoot your birds early in the morning or after the animals have gone down in the evening. Also, on no account whatever take a padre or a dog with you. Short snouters are very partial to dogs and dogs are thirsty creatures. They are also apt to trot down to the water just as you are nearing the completion of an arduous stalk, and then away go the animals and your temper with them. As regards the padre, when you have badly wounded an animal and through some fault of one of your men, you look like losing it, the air is apt to get hazy in your vicinity; also, you have those two most execrable of all living birds, the Brahminy duck and the Red wattled Lapwing, to destroy your temper. I think the most saintly person ever born would get frantic with fury if he was trying to stalk a crocodile and a couple of these lapwings saw him and started screaming at him that it was a "pity to do it," or if a pair of Brahminies started trumpeting as soon as he came in sight of them, and it is very hard indeed to keep out of sight of these birds. Many a time have I felt that I would give a good deal to have the necks of these vile creatures in a half hitch of stout cord, one end of which was fastened to a good stout stake,

driven well into the ground, and the other end in my hand. I would just glory in tightening it at the first call, and wouldn't I just pull! I think the lapwing is the worst offender, as he is there all the time, and does not even fly away, especially later on when they have young ones. The brahminy flies off before you come very near, and if the crocodile stays on after he flies off, you may be pretty sure of a shot. Herons are also rather a nuisance, but they fly off even before the brahminy and don't usually make much noise about it. Another frequent source of annoyance is that just as you are getting near your shooting point after a careful stalk, an unwitting native selects precisely that time and place to go and have a drink. One generally feels relief on these occasions by blowing off a bit of steam, and the padre might not like it. I don't know why a bit of bad language relieves one's feelings, but it certainly does have that effect.

The short snouter or man-eating crocodile is called a mugger (*Crocodilus palustris*) or a *bocha* by the natives, and the long snouter a gavial, gharial or *nakaar* (*Gavialis gangeticus*). This latter name is applied to all long snouters, but the male one, after attaining a certain stage of maturity, develops a large knob on the point of his snout, on the upper jaw, under which his nostrils are; he is then called a *Basoolia nakaar* or just simply a *Basoolia*. I believe the above explanation is correct, but do not know for certain, and I should like some definite information on the subject. The male grows considerably longer than the female, which attains to about fourteen feet from my observations I have shot males up to seventeen feet, and have seen some slightly larger, or which appeared so. The short snouter is a shorter but very much heavier animal especially as he gets bigger. Anything over thirteen feet is a big short snouter. If any of my readers could give me details of large animals of either kind, I should be much obliged. I should like, if possible, to know what the record size is. I believe that in the Sunderbands* they grow to an enormous size, but I have never seen any there. They have enormous heads, though that is not noticed till you see them at fairly close quarters.

Out of an animal 13½ feet long I took a complete corpse. It was in three portions, the head and body complete and the legs separate. That will give you an idea of what they can swallow. Their skins are very much tougher and thicker than the long snouters' skins, and take more work to remove them from the carcase. If you have the option of choosing between two animals of equal length as to which you will shoot, the long or the short snouter, you have one or two things to consider. The long snouter will give you slightly less skin but the short snouter is much more difficult to kill, and so a less certain bag. Unless it is a really big short snouter, I would advise shooting the other. In a big short snouter there is always a greater element of excitement, you also make curious finds in his stomach, such as bangles, anklets, etc. The long snouter sticks to fish and turtles, though I have heard of bangles being found in them. I don't trouble to examine them myself. In both species, however, there is always a collection of stones, sometimes quite large, swallowed, I suppose, to aid digestion. Small long snouters of from 3 to 6 feet or even a little larger may readily be killed with shot from close ranges, say ten to fifteen yards, with shot varying from No. 4 to AAA. For slightly larger animals L.G. is best. Always aim for the head or neck, though when using L. G. I am inclined to aim at the body, as two or three simultaneous blows spread over an area of about 9 inches gives the animal a tremendous shock, and as you must be quite close to use it at all, you will probably have time to rush in and get it ashore before it recovers.

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*The big Mugger of the Sunderbands is a different species to the short-snouter (*C. palustris*) Mr. Shortt writes about. The big Mugger of the Sunderbands is the sea-going crocodile (*C. porosus*) which is considered more dangerous and ferocious than *palustris*. According to Boulenger in the Fauna of British India *C. porosus* attains a length of 33 feet. The largest *palustris* in the British Museum is 12 feet long— Eds.

In skinning your animals, do not cut down the centre of the stomach, as in other animals. The stomach skin is the valuable part of the hide. The back is quite useless, being composed of a number of bony shields. Cut along the edge of the back below these hard shields, and go down to the end of the double spiky ridge on the tail. Skin right up to the chin, and in the legs, cut so as to divide the large from the small scales, and skin as far as the first joint only. After you have skinned the animal, have all the flesh and particularly the fat, removed. Then lay it flat, wet surface uppermost, and rub a plentiful supply of salt in, as much as it will absorb, and then as much more again sprinkled over it and left. Dry the skin for a couple of days till all the liquid salt has soaked in or dried up, and then roll it up, pack it in a sack and send it off. It would be much better to send it off before drying, but the railway authorities will not now take them like that, though they used to. Besides, if there is a long journey before the skin, most of the salt drips off and the skin is apt to go wrong if there is any delay in delivery. In a few days' time you will receive a letter from the tannery, telling you the skins arrived with very little salt rubbed into them, or with too much fat on them, or in a doubtful condition, but that they have taken them in hand and will do their best, etc., etc. Never mind, if you haven't spared the salt and it is not later in the year than February or March, they will be quite all right.

If at the end of your shoot you can show one skin for every two bullets, you have done well. This does not include animals shot with your gun, or shot cartridges expended. It is the animals which get away wounded, after you have put two or three bullets into them that lower your average. Ninety per cent. at least of your animals actually bagged should have been secured with a single shot each. You must also reckon on a good number of misses, as your target is a very limited one, and you know that if you go a little too high or low you will miss it. Remember that you are more apt to go low, and that with a H. V. rifle, as soon as the bullet strikes the water, it is done. It never ricochets off at the same angle it strikes the water at.

Large animals of 14 feet and over are suitable for trunks, while the smaller ones are suitable for suit cases, gladstone bags, etc.

For small articles such as purses or writing wallets, you want animals up to about 8 feet. The smaller the animal the finer the grain, and the smaller the article it is suitable for.

In closing, I will just mention a few good shooting places. I only know the Bihar district, so can speak for that only.

If you decide to shoot in this province, I would suggest the following places :—

(1) Go to Dhamarra ghat on the B. N.W. railway ; you will get some fair shooting there. There is also an inspection bungalow close to the shooting ground and station. Here there are jheels full of crocodiles, short snouters only, and also a river which goes under various names. Here it is called the Kusela. Where the railway crosses it is an excellent stretch for both species, long and short snouters. You can get a couple of days shooting here. (2) If you go to Maheskhunt station, take a bicycle and ride to Chautham, about five miles north of it. Here you can get another two days' shooting on the Ghugri. (3) This river joins the Labkhi Dhar, a branch of the Kosi, about six miles down-stream, and just below the junction is the village of Telihar. This is a great spot. (4) About a mile or so west of this, another branch of the Kosi joins the Labkhi Dhar, upstream of its confluence, with the Ghugri. I do not know the name of this other stream, but its confluence with the Labkhi is another favourite spot, particularly for short snouters, and really big ones too. (5) If you follow the Labkhi upstream you will get shooting for several miles, and good shooting, though there is a blank stretch between the last confluence mentioned and a point about two miles upstream.

(6) From Mokhana Bazaar station go east to Sonbarsa, about eight miles. Here you can get a couple of days shooting, and again (7) about five miles further east near Kasnagar. (8) From Dauram Madhipura, about six miles south lies Patharghat, about a mile and a half south-east is an excellent spot. (9) The best place of all, however, is about 6 miles east of Patharghat, round about Mokhma and Pachlakh. The main Kosi stream is here and is teeming with the reptiles, but the shooting is difficult, as the biggest crocodiles frequent banks in mid-stream, too far away for accurate shooting. There are good spots here and there, though, where, with a little trouble you can get good shots where the sand banks are at the edges of the stream. About half a mile east of Mokhma ghat is a stream, the "Sathar Dhar," running roughly parallel with the Kosi, one of its branches in fact. This is a narrow stream from 60 to 100 yards across, and is simply full of crocodiles of both classes, with plenty of good cover for stalking as a rule, though here and there it is very thick and impossible to stalk in. Between these two places you can have a week's shooting of the very best. Drinking water in the Kosi district is very indifferent. If your men are up to the ropes you will always be able to get milk and vegetables, but take your own meat ration, and a couple of tins or so of condensed milk.

You may have difficulty in getting labour, so I would strongly advise you to take your own chamars with you, and to arrange for a boat long before hand. At Sonbarsa or Khapsia, a little north of Patharghat, boats are always obtainable, though not at a moment's notice. Carts may always be obtained if you pay enough. If you go to Mokhma I would advise you to engage a boat at Khapsia, where they make boats, and then load it on to a cart and take it across country to Mokhma, as you cannot get boats there. That is a drawback on the Sathar Phar too, but there are a fair number of ghats on the stream that you can cross at ; also it is not too wide to shoot across.

I hope these few remarks may be of use to somebody. If they are I shall have done my job.

HAND-LIST OF THE "BIRDS OF INDIA."

BY

E. C. Stuart Baker, f.l.s., f.z.s., m.b.o.u.

Part IV.

(*Continued from page 744 of Volume XXVII.*)

Family Zosteropidæ.

1174. (226) **Zosterops palpebrosa palpebrosa.** *The Indian White-eye.*

Sylvia palpebrosa *Temm., Pl. Col.*, 293, *Fig.* 3, (1824), (*Bengal*) (*Cuttack Orissa*).

Bengal, Orissa, E. Central Provinces, S. India.

1175. (226) **Zosterops palpebrosa elwesi.** *The Western White-eye.*

Stuart Baker *Bull., B.O.C.*, xlii., *p.* (1921), (*Sikkim*).

E. Central Provinces, N. W. and N. India, Himalayas to N. Assam.

1176. (226) **Zosterops palpebrosa egregia.** *The Small Ceylon White-eye.*

Zosterops egregia *Madaraz, Ann, Mus., Budapest, ix., p.* 422, *Pl. xvi, Fig.* 1, ( ), (*Ceylon*).

Ceylon only.

1177. (226) **Zosterops palpebrosa cacharensis.** *The Cachar White-eye.*

Stuart Baker *Bull., B.O.C., xlii., p.* (1921), (*Gunjgong, N. Cachar*).

Assam S. of Brahmapootra to Chin Hills.

1178. (228) **Zosterops palpebrosa peguensis.** *The Pegu White-eye.*

Stuart Baker *Bull., B.O.C., xlii., p.* (1921), (*Tennasserim*).

S. Burma, E. Burma, Yunnan, ? Hainan and Formosa.

1179. (226) **Zosterops palpebrosa nicobariensis.** *The Nicobar White-eye.*

Z. nicobariensis *Blyth, J.A.S.B., xiv., p.* 563, (1845) (*Nicobars*).

Andamans and Nicobars, including Car Nicobar.

1180. (229) **Zosterops ceylonensis.** *The Large Ceylon White-eye.*

Holds., *P.Z.S.*, 1872, *p.* 459, *Pl.* 20, *Fig* 2 (*Ceylon*).

Ceylon, only above 1,000 feet.

1181. (227) **Zosterops aureiventer aureiventer**, *Hume's White-eye.*

Z. aureiventer *Hume, Str. Feath., vi., p.* 519, (1878), (*Tavoy*).
Tennasserim, Malay Peninsula, North to S. Shan States.

1182. (230) **Zosterops siamensis.** *The Siamese White-eye.*

Blyth, *Ibis*, 1867, *p.* 34, (*Siam.*)
Pegu, S.W. and Central Burma, Siam, Cochin China, etc.

Family NECTARINIIDÆ.

Sub-Family *Nectariniinæ.*

Sunbirds.

1183. (881) **Chalcostetha chalcostetha.** *Maclot's Sunbird.*

Nectarinia chalcostetha *Jardine, Nat. His. Nect., p.* 263, (1843), (*E. Indian Is.*).
Tennasserim, South through Malay Pen. to Sumatra and ?Java, etc.

1184. (882–3*) **Æthopyga siparaja seheriæ.** *The Himalayan Yellow-backed Sunbird.*

Nectarinia seheriæ *Tickell, J.A.S.B., ii., p.* 577, (1833), (*Borabhum*).
Foothills of Himalayas from Kalka to Lower Shan States.

1185. (882) **Æthopyga siparaja miles.** *The Nepal Yellow-backed Sunbird.*

Cinnyris miles *Hodg. Ind., Rev., ii., p.* 273, (1837), (*Nepal*).
Nepal, apparently above the breeding range of *seheriæ.*

1186. (884) **Æthopyga siparaja cara.** *The Tennasserim Yellow-backed Sunbird.*

Æ. cara *Hume, S.F., ii., p.* 473, (1874), (*Tennasserim*).
Siam and Burma, South from Rangoon through the Malay Pen.

1187. (885) **Æthopyga siparaja nicobarica.** *The Nicobar Yellow-backed Sunbird.*

Æ. nicobarica *Hume, S.F., i., p.* 412, (1873), (*Nocobars*).
The Nicobar Islands.

1188. (886) **Æthopyga vigorsi.** *Vigors' Yellow-backed Sunbird.*

Cinnyris vigorsi *Sykes, P.Z.S.*, 1832, *p.* 93, (*Deccan*).
S. W. Coast of India.

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*Æ. s. *andersoni* does not appear to be recognizable, the distinguishing characters being purely individual. Rothschild's *viridicauda* (Nov. Zool. XXVIII, p. 58, 1921), seems also to be founded on individual variations.

1189. (887) **Æthopyga ignicauda ignicauda.** *The Fire-tailed Yellow-backed Sunbird.*

Cinnyris ignicauda *Hodg., Ind. Rev., ii., p.* 273, (1837), (*Nepal*).
Garhwal, Nepal, Sikkim, Assam, N. & S. of Brahmapootra, Chittagong.

1190. ( ) **Æthopyga ignicauda flavescens.** *Rippon's Yellow-backed Sunbird.*

Stuart Baker *Bull., B.O.C., xli, p.* 71, (1921), *Mt. Victoria.*
Chin Hills, 9,000 feet.

1191. (888) **Æthopyga gouldiæ.** *Mrs. Gould's Sunbird.*

Cinnyris gouldiæ *Vigors, P.Z.S.*, 1831, *p.* 44, (*Himalayas*).
Himalayas from Sutlej to Assam.

1192. (889) **Æthopyga dabryi.** *Dabry's Yellow-backed Sunbird.*

Nectarinia dabryi *Verreaux, Rev. et. Mag. Zool., p.* 173, (1867), (*Ta-tsien-lu, Szechuan*).
Hills of Eastern and Southern Burma and S. W. China.

1193. (890*) **Æthopyga saturata.** *The Black-breasted Sunbird.*

Cinnyris saturata *Hodg., Ind. Rev., ii., p.* 273, (1837), (*Nepal*).
Garhwal to Assam, Cachar, Chittagong to Kauri Kachin Hills and ? Siam.

1194. (891) **Æthopyga sanguinipecta.** *Walden's Yellow-backed Sunbird.*

Walden, *A.M.N.H.*, (4), *xv., p.* 400, (1875), (*Tennasserim*).
Burma, S. and E. of Tounghoo.

1195. (892) **Æthopyga nipalensis nipalensis.** *The Nepal Yellow-backed Sunbird.*

Cinnyris nipalensis *Hodg., Ind. Rev., ii., p.* 273, (1837), (*Nepal*).
E. Nepal to E. and S. Assam, N. Burmese Hills to S. Shan States.

1196. (893) **Æthopyga nipalensis horsfieldi.** *Blyth's Yellow-backed Sunbird.*

Cinnyris horsfieldi *Blyth, J.A.S.B., xi., p.* 107, (1842), (*Nepal*).
Garhwal, Kumaon and Western Nepal.

1197. (892) **Æthopyga nipalensis victoriæ.** *Rippon's Yellow-backed Sunbird.*

Æ. victoriæ Rippon, Bull., B.O.C., xiv., p. 83, (1904), (*Mt. Victoria*).
Mt. Victoria, Chin Hills.

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* *Æthopyga anomala* Richmond P.N.S. Nat. Mus. XXII, p. 319, is merely *saturata*.

1198. (894) *Cyrtostomus lotenius. *Loten's Sunbird.*

Certhia lotenia *Linn., S.N., I., p.* 188, (1766), (*Ceylon*).
Ceylon and S. India.

1199. (895) **Cyrtostomus asiaticus asiaticus.** *The Purple Sunbird.*

Certhia asiatica *Lath., Ind. Orn., i., p.* 288, (1790), (*India*), (*Gurgaon, C. India*).
The whole of India except area occupied by *brevirostris* and *intermedia.*

1200. (895) **Cyrtostomus asiaticus brevirostris.** *The Baluchistan Purple Sunbird.*

Nectarinia (Arachnecthra) brevirostris *Blanford, Ibis,* 1873, *p.* 86, (*Jalk, Baluchistan*).
Sind, Baluchistan, Afghanistan and E. Persia.

1201. (895) **Cyrtostomus asiaticus intermedius.** *The Burmese Purple Sunbird.*

Arachnecthara intermedia *Hume, Ibis,* 1870, *p.* 436, (*Burma*).
Assam and Burma.

1202. (896) **Cyrtostomus brasiliana.** *Van Hasselt's Sunbird.*

Certhia brasiliana *Gmel., Sys. Nat., i., p.* 474, (1788), (*Brazil*), (*Java*, Oberholser).
Java and Singapore to Assam.

1203. (897†) **Cyrtostomus pectoralis pectoralis.** *The Malay Yellow-breasted Sunbird.*

Nectarinia pectoralis *Horsf., Trans., Linn. Soc., xiii., p.* 167, (1821), (*Java*).
Java, Sumatra, Borneo, Lombok, Flores, Nicobars and Malay Pen. to S. Tennasserim.

1204. (897) **Cyrtostomus pectoralis blanfordi.** *The Kondol Yellow-breasted Sunbird.*

Stuart Baker *Bull., B.O.C., xli., p.* 71, (1921), (*Kondol, Nicobars*)
Kondol Is. Nicobars.

1205. (898) **Cyrtostomus flammaxillaris flammaxillaris.** *The Burmese Yellow-breasted Sunbird.*

Nectarinia flammaxillaris *Blyth, J.A.S.B., xiv., p.* 557, (1845), (*Tennasserim*).
South Burma, Cochin China, Siam and Malay Peninsula.

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* *Cyrtostomus* and *Arachnecthra* being identical generically the former name has priority.

† I can trace no differences between *C. pectoralis pectoralis* and *C. kloss* which are not purely individual.

1206. (899) **Cyrtostomus flammaxillaris andamanicus.** *The Andaman Sunbird.*

Arachnecthra andamanica *Hume, S.F., i., p.* 404, (1873), (*Andamans*).
Andaman Islands.

1207. (900) **Cyrtostomus minimus.** *The Small Sunbird.*

Cinnyris minima *Sykes, P.Z.S.*, 1832, *p.* 99, (*Deccan*).
South India and Ceylon.

1208. (901) **Cyrtostomus zeylonicus** *The Purple-rumped Sunbird.*

Certhia zeylonica *Linn., S.N., i., p.* 188, (1766), (*Ceylon*).
Ceylon to E. Bengal. ? Khasia Hills and Faridpore.

1209. (902) **Anthreptes hypogrammica hypogrammica.** *The Banded Sunbird.*

Nectarinia hypogrammica *S. Mull. Verhand. Nat. Gesch. Zool. Aves., p.* 173, (1843), (*Sumatra*).
Peninsula Siam and Burma to Sumatra.

1210. (903) **Anthreptes malaccensis malaccensis.** *The Brown-throated Sunbird.*

Certhia malaccensis *Scop., del. Flor. et. Faun. Insubr., ii., p.* 91, (1786), (*Malacca*).
Pen. Siam and Burma, Malaya to Sumatra.

1211. (904) **Anthreptes rhodolæma.** *The Rufous-throated Sunbird.*

Shelley, *Mon. Nect., p.* 313, (1878), (*Malacca*).
S. Tennasserim to Borneo.

1212. (905) **Anthreptes simplex xanthochlora.** *The Plain-coloured Sunbird.*

A. xanthochlora *Hume, S.F., iii., p.* 330, *footnote,* (1875), (*Tennasserim*).
Pen. Burma and Siam to Malay.

1213. (906) **Arachnothera magna magna.** *The Larger Streaked Spider-hunter.*

Cinnyris magna *Hodg., Ind. Rev., ii.*, 1837, *p.* 272, (*Nepal*).
Himalayas, Sutlej to E. Assam, S. to N. Tennasserim.

1214. (907) **Arachnothera magna aurata.** *The Smaller Streaked Spider-hunter.*

A. aurata *Blyth, J.A.S.B., xxiv., p.* 478, (1855), (*Pegu*).
S. Tennasserim and Pen. Siam.

1215. (908) **Arachnothera affinis modesta.** *The Grey-breasted Spider-hunter.*

Anthreptes modesta *Eyton, P.Z.S.*, 1839, *p.* 105, (*Malaya*).
Pen. Siam and Burma to Borneo.

1216. (909) **Arachnothera longirostra longirostra.** *The Little Spider-hunter.*

Certhia longirostra *Lath., Ind Orn., i., p.* 299, (1790), (*Bengal*), (*Sylhet*).

India and Burma.

1217. (910) **Arachnothera chrysogenys.** *The Yellow-eared Spider-hunter.*

Nectarinia chrysogenys *Temm., Pl. Col., pl.* 388, *Fig. i.,* (1826), (*Java*).

S. Tennasserim to Java and Borneo.

1218. (912) **Dicæum cruentatum cruentatum.** *The Scarlet-backed Flower-pecker.*

Certhia cruentata *Linn., S.N., i., p.* 119, (1758), (*Bengal*), (*Calcutta*).

Nepal, Bhutan Dooars, Bengal and Assam.

1219. (912) **Dicæum cruentatum ignitum.** *The Burmese Scarlet-backed Flower-pecker.*

Nectarinia ignita *Begbie,* "*Mal. Pen.,*" *p.* 518, (1834), (*Malay Pen.*).

Malay Pen. N. to Chin Hills, Java and Sumatra.

1220. (912) **Dicæum cruentatum siamensis.** *The Siam Scarlet-backed Flower-pecker.*

Kloss, Ibis, 1918, *p.* 216, (*Lat Bua Kao, E. Siam*).

Siam, (Eastern Tennasserim birds appear to be this race).

1221. (913) **Dicæum trigonostigma rubropygium.** *The Tennasserim Orange-bellied Flower-pecker.*

Stuart Baker *Bull., B.O.C., xli., p.* 108, (1921), (*Mergui*).

Malay Pen. N. of 10° long., S. W. Siam amd S. Burma, Lakhimpur, Assam.

1222. (913) **Dicæum chrysorrheum intensum.** *The Sikkim Yellow-vented Flower-pecker.*

Stuart Baker *Bull., B.O.C., xli., p.* 108, (1921), (*Native Sikkim*).

Assam to Sikkim.

1223. (914) **Dicæum chrysorrheum chrysoclhore.** *The Burmese Yellow-vented Flower-pecker.*

Dicæum chrysoclhore *Blyth, J. A. S. B., xii., p.* 1009, (1843), (*Arrakan*).

Burma, Siam amd Malay Pen. North of 10° lat.

1224. (915) **Dicæum ignipectum.** *The Fire-breasted Flower-pecker.*

Myzanthe ignipectus *Hodg., Blyth., J.A.S.B., xii., p.* 983, (1843), (*Nepal*).

Himalayas from Sutlej to Assam, Burma, Siam, Malay Pen. and Islands.

1225. (916*) **Dicæum minullum concolor.** *The Nilgiri Flower-pecker.*

Dicæum concolor, *Jerdon, Madr. Jour., xi., p.* 227, (1840), (*Malabar Coast*).
West coast from Mysore, S. through the Hills to Palni Hills.

1226. (916) **Dicæum minullum subflavum.** *The Belgaum Flower-pecker.*

Stuart Baker *Bull., B.O.C., xlii., p.* (1921), (*Belgaum*).
Belgaum North to Khandala and Mahabaleshwar and ? Central Provinces.

1227. (917) **Dicæum minullum olivaceum.** *The Plain-coloured Flower-pecker.*

Dicæum olivaceum *Walden, A.M.N.H.,* (4), *xv., p.* 401, (1875), (*Tounghoo*).
Nepal, Bhutan, Assam, Burma, S. to Sumatra.

1228. (918) **Dicæum minullum virescens.** *The Andamanese Flower-pecker.*

Dicæum virescens *Hume, S.F., p.* 482, (1873), (*Port Blair, Andamans*).
Andamans.

1229. (919) **Dicæum erythrorhynchum.** *Tickell's Flower-pecker.*

Certhia erythrorhynchos *Lath., Ind. Orn., i., p.* 299, (1790), (*India*).
Whole of India, West and South Burma.

1230. (920) **Acmonorhynchus vincens.** *Legge's Flower-pecker.*

Prionochilus vincens, *Sclater, P.Z.S.,* 1872, *p.* 729, (*Ceylon*).
Ceylon only.

1231. (921) **Piprisoma squalidum squalidum.** *The Thick-billed Flower-pecker.*

Pipra squalida *Burton, P.Z.S.,* 1836, *p.* 113, (*Himalayas*).
Ceylon to Himálayas, E. to Assam, N. of Brahmapootra.

1232. (922) **Piprisoma squalidum modestum.** *Hume's Flower-pecker.*

Prionochilus modestus *Hume, S.F., iii., p.* 298, (1875), (*S. Tennasserim*).
Assam, S. of Brahmapootra to S. Tennasserim.

1233. (923) **Prionochilus ignicapillus.** *The Crimson-breasted Flower-pecker.*

Dicæum ignicapilla *Eyton, P.Z.S.,* 1839, *p.* 105, (*Malaya*).
Bankasoon, South to Sumatra and Borneo.

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* Our Indian birds are only geographical races of the Javan *D. minullum.*

1234. (924) **Prionochillus maculatus.** *The Yellow-throated Flower-pecker.*

Pardalotus maculatus *Temm., Pl. Col., iii., p.* 600, *f.* 3, (1836), (*Borneo*).
Tennasserim to Borneo. ? S. West Siam.

1235. (925) **Pachyglossa melanoxantha.** *The Yellow-bellied Flower-pecker.*

Hodg., *Blyth., J.A.S.B., xii., p.* 1010, (1843), (*Nepal*).
Nepal, East to S. Shan States and W. China, S. to Manipur.

Family Chalcopariidæ.

1236. (911) **Chalcoparia singalensis singalensis.** *The Ruby Throat.*

Motacilla singalensis *Gmel., S. N., i., p.* 964, (1788).
(*Ceylon* in errror), (*Malacca*, Oberholser).
Sikkim Duars to E. Assam, Burma, Malay Pen. and Islands.

Family Pittidæ.

1237. (926) **Anthocichla phayrii.** *Phayre's Pitta.*

Blyth, *J.A.S.B., xxxi., p.* 343, (1862), (*Tounghoo*).
South-East Burma and Siam.

1238. (927) **Pitta nipalensis.** *The Blue-naped Pitta.*

Paludicola nipalensis *Hodg., J.A.S.B., vi., p.* 103, (1837), (*Nepal*).
Nepal, N. and S. Assam, Chin Hills and Arracan.

1239. (928) **Pitta oatesi.** *The Fulvous Pitta.*

Hydrornis oatesi *Hume, S.F., i., p.* 477, (1873), (*Tennasserim*).
South Burma and S. E. Siam.

1240. (929) **Pitta cœrulea cœrulea.** *The Giant Pitta.*

Myiothera cœrulea *Raffl. Tran. L.S., xiii., p.* 301, (1822) (*Sumatra*).
South Burma and Siam to Sumatra.

1241. (930) **Pitta cyanea cyanea.** *The Blue Pitta.*

Pitta cyanea *Blyth J.A.S.B., xii., p.* 1008, (1843), (*Arracan*).
Assam, North and W. Burma and Siam.

1242. (931*) **Pitta moluccensis.** *The Lesser Blue-winged Pitta.*

Turdus moluccensis *P.Z.S., Mull., Natursyst. Suppl., p.* 144, (1776), (*Moluccas*). (*Tennasserim*).
Central and South Burma and Siam southwards. *Not* Moluccas.

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* Although the name given by Muller is unfortunate as the bird does not occur in the Moluccas, we cannot discard it for that reason.

1243. (932) **Pitta megarhyncha.** *The Large-billed Blue-winged Pitta.*

Schleg., *Vog. Ned. Ind. Pitta, p.* 32, (1863), (*Ile de Bangka*).
Tennasserim south to Malay Pen. and island of Banka.

1244. (933) **Pitta brachyura.** *The Indian Pitta.*

Corvus brachyurus *Linn., S.N., i., p.* 158, (1766), (*Muluccas, Ceylon*).
Simla to Ceylon, E. Rajputana to Assam, Chittagong and Manipur.

1245. (934) **Pitta granatina coccinea.** *The Malayan Scarlet Pitta.*

Pitta coccinea *Eyton, P.Z.S.*, 1839, p. 104, (*Malaya*).
South Tennasserim and Siam to Singapore.

1246. (935) **Pitta cucullata cucullata.** *The Green-breasted Pitta.*

Pitta cucullata *Hartl., Rev. Zool.*, 1843, p. 65, (*Malacca*).
Himalayas, Simla to Assam, S. to Tennasserim and ? Malay Pen.

1247. (935) **Pitta cucullata abbotti.** *The Nicobar Green-breasted Pitta.*

Pitta abbotti *Richmond, Pro. Nat. Mus., xxv., p.* 298, (1902), (*Nicobars*).
Great and Little Nicobars.

1248. (936) **Pitta gurneyi.** *Gurney's Pitta.*

Hume, *S.F., iii., p.* 296, *pl.* 3, (1875), (*S. Tennasserim*).
Pen. Siam and Tennasserim to Malacca.

Order EURYLAIMI.

Family EURYLAIMIDÆ.

1249. (937) **Eurylaimus javanicus javanicus.** *Horsfield's Broadbill.*

Eurylaimus javanicus *Horsf., Trans. Linn. Soc., xiii., p.* 170, (1821), (*Java*).
Malay States to Siam and Tennasserim, Sumatra, Java, *not* Borneo.

1250. (938) **Eurylaimus ochromelas.** *The Black and Yellow Broadbill.*

Raffles, *Trans. Linn. Soc., xiii., p.* 297, (1822), (*Singapore and Sumatra*).
Siam, Tennasserim South to Sumatra, etc.

1251. (939) **Cerydon sumatranus sumatranus.** *The Dusky Broadbill.*

Coracias sumatranus *Raffles, Trans. Linn. Soc., xiii., p.* 303, (1822), (*Sumatra*).
Siam, Tennasserim, South to Sumatra, *not* Borneo.

1252. (940*) **Cymborhynchus macrorhynchus macrorhynchus.** *The Black and Red Broadbill.*

Todus macrorhynchus *Gmel., S.N., i., p.* 446, (1788), (*Borneo*).
Tennasserim, South through the Malay Peninsula, Siam.

1253. (941) **Cymborhynchus affinis.** *The Arrakan Black and Red Broadbill.*

Blyth, *J.A.S.B., xv., p.* 312, (1846), (*Arrakan*).
Arrakan, South to Cape Negrais and Rangoon.

1254. (942) **Serilophus lunatus lunatus.** *Gould's Broadbill.*

Eurylaimus lunatus *Gould, P.Z.S.*, 1833, *p.* 133, (*Rangoon*).
Tennasserim, Pegu Karennee.

1255. (943) **Serilophus lunatus rubropygius.** *Hodgson's Broad bill.*

Raya rubropygia *Hodg., J.A.S.B., viii., p.* 36, (1839), (*Nepal*).
Himalayas to East and South Assam, Manipur, Arrakan and Chin Hills.

1256. (944) **Psarisomus dalhousiæ.** *The Long-tailed Broadbill.*

Eurylaimus dalhousiæ *Jameson, Edinb., N. Ph. J., xviii., p.* 389, (1835), (N. India).
Himalayas from Mussorie to E. Assam, Burma to Malay Pen.

1257. (945) **Calyptomena viridis.** *The Green Broadbill.*

Raffles, *Trans. L.S., xiii., p.* 295, (1822), (*Sumatra*).
Tennasserim, S. Siam and Malay Pen.

Order PICI.

Family Picidæ.

1258. (946) **Picus squamatus squamatus.** *The Scaly-bellied Green Woodpecker.*

Picus squamatus *Vigors, P.Z.S.*, 1931, *p.* 8, (*Himalayas*).
Gilgit to Kashmir and Western Nepal.

1259. (947) **Picus squamatus flavirostris.** *Hargitt's Scaly-bellied Green Woodpecker.*

Gecinus flavirostris *Menzbier, Bull., Nat. Moscow, p.* 440 1886, (*Murghab*).
Trancaspia to Baluchistan and Afghanistan.

1260. (948) **Picus striolatus.** *The Little Scaly-bellied Green Woodpecker.*

Blyth, *J.A.S.B, xii., p.* 1000, (1843), (*Nepal*).
Himalayas, east to Burma, Siam.

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* I cannot separate *lemniscatus* (Raffles) whilst *affinis* appears to be a species rather than a race, there being no connecting forms. *C. m. malaccensis* may be found within our limits.

1261. (949) **Picus vittatus vittatus.** *The Malay Scaly-bellied Green Woodpecker.*

Picus vittatus *Vieill., Nouv. Dict. d'Hist. Nat., xxvi.*, 1818, *p.* 91, (*Malacca*).
Malay States, Java, Pen. Siam and Burma.

1262. (949) **Picus vittatus viridanus.** *The Burmese Scaly-bellied Green Woodpecker.*

Picus viridanus *Blyth, J.A.S.B., xii.*, 1843, *p.* 1000, (*Arrakan*).
Burma, Chin and Kachin Hills, Shan States, N. and Central Siam.

1263. (950) **Picus canus occipitalis.** *The Indian Black-naped Green Woodpecker.*

Picus occipitalis *Vigors, P.Z.S.*, 1830, *p.* 8, (*Mussoorie*).
N. W. Himalayas to Eastern Nepal.

1264. (950) **Picus canus gyldenstolpei.** *The Assam Black-naped Green Woodpecker.*

Stuart Baker, *Bull., B.O.C., xxxix*, 1918, *p.* 19, (*Sadiya, Assam*).
Sikkim, Assam, Cachar, Sylhet, Manipur, Looshai Hills.

1265. (950) **Picus canus hessei.** *The Burmese Black-naped Green Woodpecker.*

Gecinus canus hessi *Gyldenstolpe, Orn. Monatsb., xxiv., p.* 28, (1916), (*N. Siam*).
North Central and S. Burma, Siam as far S. as Mulmein.

1266. (951) **Picus chlorolophus chlorolophus.** *The Small Himalayan Yellow-naped Woodpecker.*

Picus chlorolophus *Vieill., Nouv. Dict. d'Hist. Nat., xxvi., p.* 78, (1818), (*Bengal*).
Himalayas and Hill ranges of Burma.

1267. (952) **Picus chlorolophus chlorigaster.** *The Southern Yellow-naped Woodpecker.*

Picus chlorigaster *Jerd., Madr. Jour. L.S., xiii., pt.* 2, *p.* 139, (1844), (*S. India*).
Hills of Southern India and Ceylon.

1268. (953) **Picus puniceus puniceus.** *The Crimson-winged Green Woodpecker.*

Horsf. *Trans. Linn. Soc., xiii., p.* 176, (1821), (*Java*).
Tennasserim, South to Sumatra, Java and Borneo.

1269. (954) **Picus erythropygius nigrigenis.** *The Red-rumped Green Woodpecker.*

Gecinus nigrigenis *Hume, P.A.S.B.*, 1874, *p.* 106, (*Pakchan, Tennasserim*).
Central and South Burma, West Siam and N. Malay Pen.

1270. (955) **Chrysophlegma flavinucha flavinucha.** *The Large Yellow-naped Woodpecker.*

Picus flavinucha *Gould, P.Z.S.*, 1833, *p.* 120, (*Himalayas*).
Himalayas from Mussoorie to the Kachin Hills, Burma and Siam.

1271. (956) **Chrysophlegma mentalis humii.** *The Chequered-throated Woodpecker.*

Chrysophlegma humii *Hargitt, Ibis*, 1889, *p.* 231, (*Malacca*).
Tennasserim, South to Sumatra.

1272. (957) **Callolophus miniatus malaccensis.** *The Banded Red Woodpecker.*

Picus malaccensis *Lath., Ind. Orn., i., p.* 241, (1790). (*Malacca*)
Tennasserim, South to Sumatra and Borneo.

1273. (958*) **Gecinulus grantia grantia.** *The Northern Pale-headed Woodpecker.*

Picus grantia *McClelland, P.Z.S.*, 1839, *p.* 165, (*Assam*).
Nepal to Assam, Chin, Kachin Hills, N. Siam to French Laos.

1274. (959) **Gecinulus grantia viridis** *The Southern Pale-headed Woodpecker.*

G. viridis *Blyth, J.A.S.B., xxxi., p.* 341, (1862), (*Pakpoon, Tennasserim*).
S. W. Siam and S. Burma to Kossum.

1275. (960) **Dryobates hyperythrus hyperythrus.** *The Rufous-bellied Pied Woodpecker.*

Picus hyperythrus *Vigors, P.Z.S., p.* 23, (1831), (*Himalaya, Darjiling*).
Himalayas, Nepal to N. Shan States.

1276. (960) **Dryobates hyperythrus marshalli.** *The Western Rufous-bellied Pied Woodpecker.*

Hartert, *Vog. Pal., vii., p.* 926, (1912), (*Murree*).
N. W. Himalayas.

1277. (961) **Dryobates himalayensis.** *The Western Himalayan Pied Woodpecker.*

Picus himalayensis *Jard. & Sel., Ill. Orn., iii., pl.* 116, (1835), (*Mussuri*).
N. W. Himalayas, Afghanistan to Murree.

1278. (962) **Dryobates cabinisi cabinisi.** *The Chinese Pied Woodpecker.*

Picus cabanisi *Malh., Jour. f. Orn.*, 1854, *p.* 172, (*China*).
Manipur, Chin and Kachin Hills to China.

**Gecinulus viridis robinsoni* of Kloss. (Ibis, 1918, p. 105) is founded on individual variation only.

1279. (963) **Dryobates scindeanus.** *The Sind Pied Woodpecker.*

Picus scindeanus *Horsf. & Moore, Cat. B., ii., p.* 671, (1856-8), (*Shikarpore*).
S. E. Persia, Baluchistan, Sind and W. Punjab.

1280. (964) **Dryobates darjellensis.** *The Darjeeling Pied Woodpecker.*

Picus darjellensis *Blyth, J.A.S.B., xiv., p.* 196, (1845), (*Darjiling*).
Himalayas, Nepal to Mts. of W. China.

1281. (965) **Dryobates cathparius cathparius.** *The Lesser Pied Woodpecker.*

Picus cathparius *Blyth, J.A.S.B., xii., p.* 1006, (1843), (*Darjiling*).
Nepal, Sikkim and Assam, N. and S. of Brahmapootra.

1282. (966) **Dryobates cathparius pyrrhothorax.** *The Red-breasted Pied Woodpecker.*

Picus pyrrhothorax *Hume, S.F., x., p.* 150, (1887), (*Aimole, E. Manipur*).
Hills S. of Brahmapootra.

1283. (967) **Dryobates macei macei.** *The Fulvous-breasted Pied Woodpecker.*

Picus macei *Vieill., Nouv. Dict.d' Hist. Nat., xxvi., p.* 80, (1818), (*Bengal*).
Himalayas from Murree to E. Assam, (S. of Brahmapootra).

1284. (968) **Dryobates macei atratus.** *The Stripe-breasted Pied Woodpecker.*

Picus atratus *Blyth, J.A.S.B, xviii., p.* 803, (1849), (*Tennasserim*).
Hills S. of Brahmapootra, Burmese Hills to Tennasserim.

1285. (969) **Dryobates auriceps.** *The Brown-fronted Pied Woodpecker.*

Picus auriceps *Vigors., P.Z.S,* 1831, *p.* 44, (*Himalayas*), (*Simla*).
Himalayas, Afghanistan to W. Nepal.

1286. (970) **Dryobates pectoralis pectoralis.** *The Spotted-breasted Pied Woodpecker.*

Picus pectoralis *Blyth, J.A.S.B., xv., p.* 15, (1846), (No Hab. given.)
Southern Burma and S. W. Siam.

1287. (971) **Dryobates pectoralis andamanensis.** *The Andaman Pied Woodpecker.*

Picus andamanensis *Blyth, J.A.S.B., xxviii., p.* 412, (1859), (*Andamans*).
Andamans.

1288. (972) **Liopicus mahrattensis.** *The Yellow-fronted Pied Woodpecker.*

Picus mahrattensis *Lath., Ind. Orn. Supp., p. xxxi.*, (1801), (*India*).
Ceylon, India and Burma.

1289. (973*) **Iyngipicus semicoronatus.** *The Darjiling Pigmy Woodpecker.*

Picus semicoronatus *Malherbe, Bull., Soc. d'Hist. Nat. Moselle, v., p.* 21, (1848), (*Himalayas*).
Sikkim to E. Assam, Manipur, Chin, Kachin Hills and Yunnan.

1290. (974) **Iyngipicus pygmaeus.** *The Himalayan Pygmy-Woodpecker.*

Picus pygmaeus *Vigors, P.Z.S.*, 1831, *p.* 44, (*Himalayas*).
Western Himalayas to Nepal.

1291. (978) **Iyngipicus canicapillus.** *The Burmese Pygmy Woodpecker.*

Picus canicapillus *Blyth, J.A.S.B., xiv., p.* 197, (1845), (*Arrakan*).
Burma and ? Cachar, Manipur.

1292. (976) **Iyngipicus hardwickii.** *The Indian Pygmy Woodpecker.*

Picus hardwickii *Jerd., Madr. Jour. L. S., xiii., p.* 138, (1844), (*S. India*).
Northern India.

1293. (979) **Iyngipicus gymnopthalmus.** *The Ceylon Pygmy Woodpecker.*

Picus gymnopthalmus *Blyth, J.A.S.B., xviii., p.* 804, (1849), (*Ceylon*).
Ceylon and S. India.

1294. (978) **Blythipicus pyrrhotis pyrrhotis.** *The Red-eared Bay Woodpecker.*

Picus pyrrhotis *Hodg., J.A.S.B., vi., p.* 108, (1837), (*Nepal*).
Nepal to South Burma and E. to Annam.

1295. (979) **Blythipicus pyrrhotis rubiginosus.** *The Malay Bay Woodpecker.*

Hemicircus rubiginosus *Swainson, B. of W. Africa, ii., p.* 150, (1837), (*W. Africa*).
Tennasserim, South to Sumatra and Borneo.

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* The genus *Iyngipicus* requires careful working out. Nothing has been attempted in this list.

1296. (980) **Miglyptes tristis grammithorax.** *The Fulvous-rumped Barred Woodpecker.*

Phaiopicus grammithorax *Malh., Picidae, ii., p.* 12, (1802), (*Malay Pen.*)
Peninsular, Siam and Burma to Sumatra and Borneo.

1297. (981) **Miglyptes tukki.** *The Buff-necked Barred Woodpecker.*

Picus tukki *Less., Rev. Zool.*, 1839, *p.* 167, (*Sumatra*).
Extreme South Tennasserim to Borneo.

1298. (982) **Miglyptes jugularis.** *The Black and Buff Woodpecker.*

Picus jugularis *Blyth, J.A.S.B., xiv., p.* 195, (1845), (*Arrakan*).
Central and South Burma, Siam and Cochin China.

1299. (984) **Micropternus brachyurus williamsoni.** *The Siam Rufous Woodpecker.*

Kloss, *Ibis*, 1918, *p.* 107, (*Koh Lak, S. W. Siam*).
Peninsular Burma and Siam.

1300. (983) **Micropternus brachyurus phaioceps.** *The Northern Rufous Woodpecker.*

Micropternus phaioceps *Blyth, J.A.S.B., xiv., p.* 195, (1845), (*Arrakan*).
Nepal, N. Assam, Burma, Shan States, N. and W. Siam.

1301. (983) **Micropternus brachyurus humei.** *The Western Rufous Woodpecker.*

Kloss, *Ibis.*, 1918, *f.* 109, (*Rohilkund*).
N. W. Himalayas.

1302. (983) **Micropternus brachyurus mesos.** *The Orissa Rufous Woodpecker.*

Kloss, Ibis, 1918, *p.* 109, (*Kuttak, Orissa*).
Bengal, Behar, N. Orissa and Assam S. of Brahmapootra.

1303. (985) **Micropternus brachyurus gularis.** *The Madras Rufous Woodpecker.*

Picus gularis *Jerd., Madr. Jour., xiii., p.* 139, (1844), (*Southern India*).
India, S. of Orissa and Bombay, *not S.* Travancore.

1304. (985) **Micropternus brachyurus lanka.** *The Ceylon Rufous Woodpecker.*

Kloss, *Ibis*, 1918, *p.* 108, (*Ceylon*).
Ceylon and South Travancore.

1305. (986) **Brachypternus aurantius aurantius.** *The Northern Golden-backed Woodpecker.*

Picus aurantius *Linn., S.N., i., p.* 174, (1766), (*Cape of Good Hope*) (*Behar*).
N. W. India, N. India, Bengal, Central India, Orissa and Bombay.

1306. (986*) **Brachypternus aurantius puncticollis.** *The Southern Golden-backed Woodpecker.*

Brachyternopicus puncticollis *Malh., Rev. Zool.*, 1845, *p.* 405, (*Ceylon*).
India S. of range of last bird and Ceylon.

1307. (986) **Brachypternus aurantius dilutus.** *The Sind Golden-backed Woodpecker.*

Brachypternus dilutus *Blyth, Cat., p.* 56, (1852), (*Sind*).
Sind, Baluchistan and ? Punjab.

1308. (987*) **Brachypternus aurantius erithronotus.** *The Red-backed Woodpecker.*

Picus erithronotus *Vieill., Nouv. Dict. d'Hist. Nat., xxvi., p.* 73, (1818), (*Ceylon*).
Ceylon (area different to that occupied by No. 1306).

1309. (988) **Tiga javanensis intermedia.** *The Burmese Golden-backed Three-toed Woodpecker.*

Picus intermedius *Blyth, J.A.S.B.*, 1845, *p.* 193, (*Arrakan*).
Assam, S. of Brahmapootra, Chin Hills and N. Arrakan.

1310. (988) **Tiga javanensis rubropygialis.** *The Malabar Golden-backed Three-toed Woodpecker.*

Picus rubropygialis *Malh., Rev. Zool.*, 1845, *p.* 400, (Bengal).
S. India, north to Southern Orissa and Bombay.

1311. (989) **Tiga shorii.** *The Himalayan Golden-backed Three-toed Woodpecker.*

Picus shorii *Vigors, P.Z.S.*, 1831, *p.* 175, (*Himalaya Mts.*).
Himalayas, Nepal through Burmese Hill Ranges.

1312. (990) **Gauropicoides rafflesi peninsularis.** *The Malayan Three-toed Woodpecker.*

Hesse, *Orn. Monatsb., xix.*, 1911, *p.* 192, (*Malacca*).
S. Tennasserim, S.W. Siam and Malay Peninsula.

1313. (991) **Chrysocolaptes festivus** *The Black-backed Woodpecker.*

Picus festivus *Bodd., Tabl., Pl. Enl., p.* 43, (1783), (*Goa*).
Indian Plains and Ceylon.

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* A series shewn me by Mr. W. E. Wait proves quite satisfactorily that *erithronotus* is only a race of *aurantius*

1314. (992) **Chrysocolaptes guttacristatus guttacristatus.** *Tickell's Golden-backed Woodpecker.*

Picus guttacristatus *Tickell, J.A.S.B., ii.*, 1833, *p.* 578, (*Borabhum*).
Behar, Bengal, Assam, Burma, North of Rangoon, Siam, etc.

1315. (992) **Chrysocolaptes guttacristatus sultaneus** *Hodgson's Golden-backed Woodpecker.*

Picus sultaneus *Hodg., J.A.S.B., vi.*, 1837, *p.* 105, (*Nepal*).
N. W. India, Mussoree to Nepal.

1316. (992) **Chrysocolaptes guttacristatus delesserti.** *Malherbe's Golden-backed Woodpecker.*

Indopicus delesserti *Malh., Mem. Acad. Metz.*, 1848, *p.* 343, (*Malabar*).
India, S. of Bombay and Orissa, Peninsular Burma, Siam and Malaya.

1317. (993) **Chrysocolaptes guttacristatus stricklandi.** *Layard's Woodpecker.*

Brachypternus stricklandi *Layard, A.M.N.H.*, (2), *xiii.*, *p.* 449, (1554), (*Ceylon*).
Ceylon only.

1318. (994*) **Hemicercus sordidus.** *The Grey and Buff Woodpecker.*

Dendrocopus sordidus *Eyton, A.M.N.H., xvi.*, *p.* 229, (1845), (*Malacca*).
Tennasserim, South to Malay Pen.

1319. (995) ***Hemicercus canente.** *The Heart-spotted Woodpecker.*

Picus canente *Less., Cent. Zool.*, *p.* 215, (1830), (*Pegu*).
Assam, S. of the Brahmapootra to Siam, etc., Malabar coast.

1320. (996) **Alophonerpes pulverulentulus harterti.** *Hesse's Great Slaty Woodpecker.*

Muleripicus p. harterti *Hesse, Orn. Monatsb.*, *p.* 182, (1911), (Assam).
Himalayas, Simla to Assam, Burma, Malay States, etc.

1321. (997) **Thriponax hodgsonii hodgsonii.** *The Malabar Great Black Woodpecker.*

Hemilophus hodgsonii *Jerd., Madr. Jour., xi.*, *p.* 215, (1840), (*Malabar Coast*).
S. W. India from Travancore to Belgaum.

* There are probably several races of this genus which require working out.

1322. (998) **Thriponax hodgsonii feddeni.** *The Burmese Great Black Woodpecker.*

Mulleripicus feddeni *Blanf.*, *Blyth, J.A.S.B., xxxii., p.* 75, (1863), (*Pegu*).
Burma, Siam, Annam and Cochin China.

1323. (999) **Thriponax javanensis.** *The Malay Black Woodpecker.*

Picus javanensis *Lungh., K. Vet. Ac. Nya. Hand-b. xviii., p.* 137, (1797) (*Java*).
Malay Peninsula to Phillippines.

1324. (1000) **Thriponax hodgei.** *The Andaman Black Woodpecker.*

Mulleripicus hodgei *Blyth, J.A.S.B., xxix., p.* 105, (1860), (*Andamans*).

Sub-Family PICUMNINÆ.

1325. (1001) **Picumnus innominatus innominatus.** *The Himalayan Speckled Piculet.*

P. innominatus *Burton, P.Z.S.*, 1836, *p.* 154, (*Himalayas*).
Himalayas, Kumaon to Assam.

1326. (1001) **Picumnus innominatus malayorum.** *The Malay Speckled Piculet.*

Hartert, *Vog. Pal., vii., p.* 937, (1912), (*Perak*).
Burma to Borneo, Annam.

1327. (1001) **Picumnus innominatus avunculorum.** *The Madras Speckled Piculet.*

Hartert, *Vog. Pal., vii., p.* 937, (1912), (*Nilgiris*).
Hills of Southern India.

1328. (1002) **Sasia ochracea ochracea.** *The Indian Rufous Piculet.*

Sasia ochracea *Hodg., J.A.S.B., v., p.* 777, (1836), (*Nepal*).
Himalayas to Assam and Kachin Hills.

1329. (1002) **Sasia ochracea reichenowi.** *The Burmese Rufous Piculet.*

Hesse, *Orn. Monatsb., xix., p.* 181, 1911, (*Burma*).
Burma, Siam, Annam, N. Malay Pen.

1330. **Sasia abnormis abnormis.** *Temminck's Rufous Piculet.*

Picumnus abnormis *Temm., Pl. Col., iv., pl.* 371, (1825), (*Java*).
Siam, Tennasserim to Sumatra, Borneo, etc.

Sub-family *Iynginæ*.

1331. (1003) **Iynx torquilla japonica.** *The Kashmir Wryneck.*

Iynx japonica *Bonap., Con. Av., i., p.* 150, (1850), (*Japan*).
E. Siberia to Japan, Himalayas, Kashmir to China.

Family INDICATORIDÆ.

1332. (1004) **Indicator xanthonotus.** *The Yellow-backed Honey-Guide.*

Blyth, *J.A.S.B., xi., p.* 166, (1842). (*Darjiling*).
Himalayas, E. to Sikkim, Abbottabad.

Family CAPITONIDÆ.

1333. (1005) **Caloramphus fuliginosa hayi.** *The Brown Barbet.*

Bucco hayi *Gray, Zool. Misc., p.* 33, (1831), (*Malacca*).
Tennasserim, south to Sumatra.

1334. (1007) **Megalæma virens virens.** *The Great Chinese Barbet.*

Bucco virens *Bodd., Tabl. Pl. Enl.*, (1783), (*China*).
Central and South Burma, east to China.

1335. (1006) **Megalæma virens marshallorum.** *The Great Himalayan Barbet.*

M. marshallorum *Swinhoe, A.M.N.H., p.* 348, (1870) (*Nepal*).
Himalayas from Murree to Assam and N. Burma.

1336. (1008) **Thereiceryx zeylanicus zeylanicus.** *The Ceylon Green Barbet.*

Bucco zeylanicus *Gmel., Syst. Nat., i., p.* 408, (1788), (*Ceylon*).
Ceylon and South Travancore.

1337. (1008) **Thereiceryx zeylanicus caniceps.** *The Northern Green Barbet.*

Bucco caniceps *Franklin, P.Z.S.*, 1831, p. 121, (*Calcutta. Benares*).
Northern India from extreme W. to Western Bengal.

1338. (1008) **Thereiceryx zeylanicus inornatus.** *The Bombay Green Barbet.*

Megalæma inornata *Walden, A.M.N.H., Series iv., v., p.* 219 (1870), (Coorg).
West Coast from N. Travancore to Bombay.

1339. (1009) **Thereiceryx lineatus hodgsoni.** *The Assam Lineated Barbet.*

Megalæma hodgsoni *Bonap., Cons. Av., i., p.* 144, (1850). (*Nepal*).
Nepal to N. Siam.

1340. (1009) **Thereiceryx lineatus intermedius.** *The Burmese Lineated Barbet.*

Stuart Baker, *Bull., B.O.C., xxxix.*, 1918, *p.* 9, (*Pakpoon Burma*).
Central, south and peninsular Burma and Siam.

1341. (1010) **Thereiceryx viridis.** *The Small Green Barbet.*

Bucco viridis *Bodd., Tabl. Pl. Enl., p.* 53, (1783), (*India*).
South and South West India.

1342. (1011) **Chotorhea mystacophanes.** *The Gaudy Barbet.*

Bucco mystacophanes *Temm., Pl. Col. No.* 315, 1824, (*Sumatra*).
Tennasserim, south to Sumatra.

1343. (1012) **Cyanops asiatica asiatica.** *The Blue-throated Barbet.*

Trogon asiaticus *Lath., Ind. Orn., p.* 201, (1790), (*India*).
Himalayas, Chamba to South Burma.

1344. (1012) **Cyanops asiatica rubescens.** *The Ruddy Barbet.*

C. rubescens *Stuart Baker, Nov. Zool., iii., p.* 257, (1896), (*N. Cachar*).
Hills, S. of Brahmapootra *above* 3,500 feet.

1345. (1013) **Cyanops asiatica davisoni.** *Davison's Blue-throated Barbet.*

Megalæma davisoni *Hume, S.F., v., p.* 108, (1877), (*Meetan, S. Tennasserim*).
S. Tennasserim and S. W. Siam.

1346. (1014) **Cyanops incognita.** *Hume's Blue-throated Barbet.*

Megalaima incognita *Hume, S. F., ii., p.* 442, (1874) (*Tennasserim, 25 m. N. of Yea*).
Tavoy to Southern Tennasserim.

1347. (1015) **Cyanops flavifrons.** *The Yellow-fronted Barbet.*

Bucco flavifrons *Cuvier, Régne An., i., p.* 428, *ex Levaill.* (1817), (*Ceylon*).
Ceylon.

1348. (1016) **Cyanops duvauceli robinsoni.** *The Malay Blue-eared Barbet.*

Stuart Baker, *Bull., B.O.C., xxxix.*, 1918, *p.* 20, (*Klang Malay Pen.*)
Pen, Siam amd Burma and Malay Pen.

1349. (1016) **Cyanops duvauceli cyanotis.** *The Indian Blue-eared Barbet.*

Bucco cyanotis *Blyth, J.A.S.B., xvi., p.* 487, (1847), (*Bengal*).
Sikkim, Bhutan, Assam, Burma and Siam.

1350. **Cyanops robustirostris.** *The Thick-billed Barbet.*

Stuart Baker, *Bombay Nat. His. Jour., x., p.* 356, (1896), (*N. Cachar*).
N. Cachar Hills, Naogang and ? Yunnan.

1351. (1017) **Cyanops franklinii franklinii.** *The Golden-throated Barbet.*

Bucco franklinii *Blyth, J.A.S.B., xi., p.* 167, (1842), (*Darjiling*).
Nepal to Assam and Chin Hills.

1352. (1018) **Cyanops franklinii ramsayi.** *Ramsay's Golden-throated Barbet.*

Megalæma ramsayi *Walden, A.M.N.H., xv., p.* 400, (1875), (*Karennee*).
Central and S. Burma, Siam and Malay Pen.

1353. (1019) **Xantholæma hæmacephala indica.** *The Indian Crimson-breasted Barbet.*

Bucco indicus *Lath., Ind. Orn., i., p.* 205, (1790), (*India*), (*Calcutta*).
Plains of India, Ceylon, Burma, Siam, Yunnan, Malay Pen. to Sumatra.

1354. (1020) **Xantholæma malabarica.** *The Crimson-throated Barbet.*

Bucco malabaricus *Blyth, J.A.S.B., xvi., pp.* 386, 465, (1847), (*Malabar*).
Malabar Coast.

1355. (1021) **Xantholæma rubricapilla.** *The Small Ceylon Barbet.*

Bucco rubricapillus *Gmel., Syst. Nat., i., p.* 408, (1788), (*Ceylon*).

Order ANISODACTYLI.

Sub-order CORACIÆ.

Family Coraciidæ.

1356. (1022) **Coracias benghalensis benghalensis.** *The Northern Indian Roller.*

Corvus benghalensis *Linn., S.N., x., ed. i., p.* 106, (1758), (*Bengal*).
Persian Gulf, Northern India to E. Bengal.

1357. (1022) **Coracias benghalensis indica.** *The Southern Indian Roller.*

Coracias indica *Linn., S.N., xii., ed. I., p.* 159, (1766), (*Ceylon*).
The South of India and Ceylon.

1358. (1023) **Coracias benghalensis affinis.** *The Burmese Roller.*

C. affinis *McClell., P.Z.S.*, 1839, *p.* 164, (*Assam*).
Assam, Burma and Siam.

1359. (1024) **Coracias garulla semenowi.** *The Kashmir Roller.*

Loud. & Tschusi, *Orn. Jahrb., xiii., p.* 148, (1902), (*Transcaspia*).
Transcaspia to Kashmir and Garhwal.

1360. (1025*) **Eurystomus orientalis orientalis.** *The Indian Broad-billed Roller.*

Coracias orientalis *Linn., S.N. I., p.* 159, (1766), (*India*).
India, Burma, Siam and Southwards.

1361. (1025) **Eurystomus orientalis gigas.** *The Andaman Broad-billed Roller.*

Stresemann, *Nov. Zool., xx., p.* 299, (1913), (*S. Andamans*).
South Andamans.

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* I find it quite impossible to separate *orientalis, calonyx* and *lacteor* and think the alleged differences are all individual rather than sub-specific. *gigas* is separable on account of its large size and large bill.

(*to be continued.*)

INDIAN DRAGONFLIES.

BY

MAJOR F. C. FRASER, I.M.S.

(With 4 Text figures.)

(Continued from page 691 of Volume XXVII.)

Family—AESCHNIDÆ.

PART XI.

Insects usually of large size, with long and cylindrical abdomen. Eyes markedly or only slightly contiguous or more or less widely separated; ocelli arranged transversely in front of vesicle; labium with the middle lobe not markedly smaller than or overlapped by the lateral lobes, the latter not furnished with a moveable hook; antenodal nervures of 1st and 2nd series not coinciding save for occasional individuals; trigones more or less similar in all wings and situated equally distal to the arc; anal appendages specialized; a well developed ovipositor present in the females.

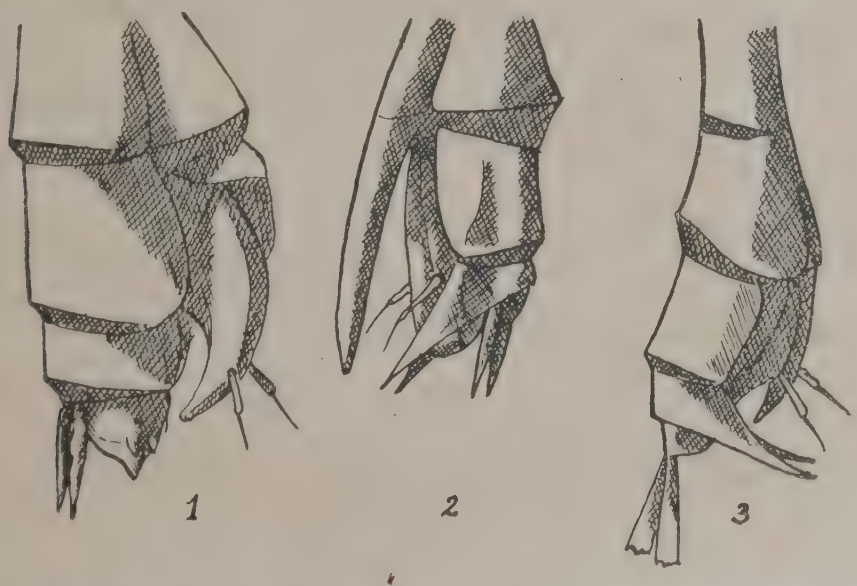


Fig.—1. Abdominal endings of females of 1. *Cephalæschna*, 2. *Gynacanthæschna*, 3. *Gynacantha* (anal appendages shown broken off).

Subfamily 1.—AESCHNINÆ.

Insects of large size, with long and cylindrical abdomen. Head large and globular; eyes markedly contiguous, which is the first essential character separating them from the following subfamily *Gomphinæ*. Generally speaking, *Anax* and *Gynacantha* have very large eyes which are contiguous for a long distance, whilst they are smaller and less contiguous in the *Æschninæ*.

Wings long and broad, reticulation usually close, trigones elongated in the long axis of the wing and closely similar in shape in all wings. In the group *Anax* the wings are similar in the two sexes, the males of all other groups and genera have the anal borders excavated or straight and the anal angle prominent but less so in *Anaciæschna*. The anal border has a large triangle divided

into two or more cells and defined by a straight nervure which leaves the subcostal nervure and forms the acute point of the triangle by meeting the anal border near the anal angle (or tornus). In the group *Anax* the similarity between the two sexes is very marked, the anal triangle disappearing in both completely.

Orcillets more or less developed or in the group *Anax*, entirely absent. The connection between these organs and the excavation of the hindwings has already been commented on in dealing with *Hemicordulia asiatica.*

The basal space (for which I propose the new name "arcular space" as it is limited outwardly by the arc) is either entire or traversed by several nervures. The 4th nervure (nodal sector) either curved uniformly or making an abrupt curve towards the costa beneath the stigma; the 5th nervure (Rs or subnodal sector) either bifurcated or not, at or before the inner end of the stigma.

♀ The terminal border of the 10th abdominal segment beneath (known as the "dentigerous plate") most generally rounded and most often denticulate, but in *Gynacantha*, *Gynacanthœschna* and *Periœschna* it is prolonged into a long, bifurcated fork.

Hab.—Cosmopolitan.

It is impossible to give an entirely satisfactory key for this subfamily owing to the paucity of our knowledge of several forms of which only one or the other sex is at present known. This applies especially to the imperfectly known genera *Cali*—and *Cephalœschna.*

Dr. Laidlaw in the Records of the Indian Museum has pointed out the errors which have crept into the nomenclature of the species of these two genera and these may be usefully recapitulated here.

The genus *Caliœschna* was founded by Selys in 1883 *Æschna microstigma*, Schneider, being the type. The rounded, subdenticulate, dentigerous plate which is a characteristic of the female of this species was unknown to Selys when he founded the related genus *Cephalœschna* from *C. orbifrons* in 1885 and he gave the same character as of generic value to this genus.

Noticing that Selys had overlooked the character of the dentigerous plate in *Caliœschna microstigma*, Martin, in 1909, made the error of suppressing the genus *Cephalœchna* and of placing *C. orbifrons* in the genus *Caliœschna* without taking into account the diversity of the two species in other respects. A distinguishing feature is the remarkable development of the frons in *Cephalœschna orbifrons* as compared with the normal development found in *Caliœschna microstigma.*

Karsch in 1891 taking the development of the frons as the most important feature described *Cephalœschna sikkima.* In this species the dentigerous plate of the female is forked very much the same as is found in species belonging to the genus *Gynacantha* so that it clearly cannot be placed in the genus *Cephalœschna* and for a similar reason it falls outside the range of *Caliœschna.*

Thus it is seen that *Cephalœschna* must be retained and a new genus must be erected to contain Karsch's species, and others resembling it.

The three genera may be briefly defined as follows:—

1. **Caliæschna** with the dentigerous plate of the female rounded and subdenticulate and the frons of normal development. Type—*C. microstigma*, Schneid.
2. **Cephalæschna** with the dentigerous plate of the female rounded and subdenticulate and the frons remarkably developed.—Type—*C. orbifrons*, Selys.
3. **Gynacantnæsohna** *gen. nov.* with the dentigerous plate of the female forked and the frons remarkably developed. Type.—*C. sikkima.* Karsch.

Dr. Tillyard merges the genus *Hemianax* with *Anax* but I prefer to keep them separate, as in addition to the absence of the supplementary ridges to abdomen, there are other generic characters.

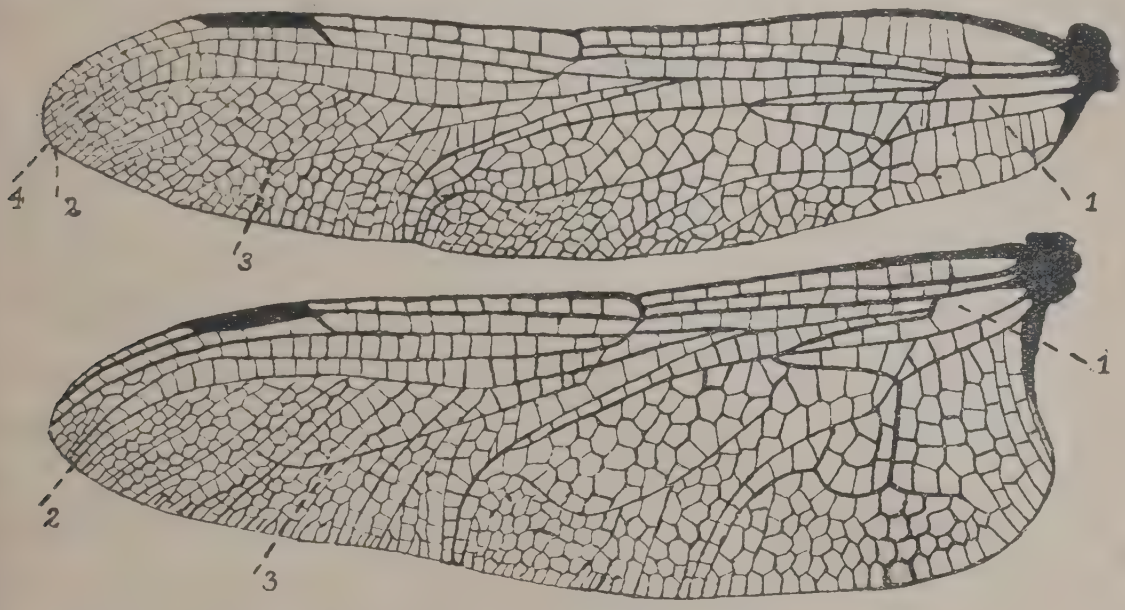


Fig. 2.—Wings of *Anax parthenope parthenope*, male.

1. Arcular or basal space, 2. 5th nervure (Rs), 3. 5a nervure (Rspl), 4. 4th nervure (M2 or nodal sector).

Key to the Sub-family—ÆSCHNINÆ.

1 { Anal border of hindwing rounded in both sexes; 5th nervure (Rs) not bifurcated; 4th nervure (M2 or nodal sector) with an abrupt convexity forwards at outer end of stigma; sectors of arc arising from above the middle of arc 2
Anal border of the hindwing rounded in the female only; 5th nervure bifurcated (except in *Jagoria*); 4th nervure uniformly curved as far as termen; sectors of arc arising from or below the middle of arc 7

2 { Genus *Hemianax*:—
Only a single, lateral bordering ridge to segments 4 to 8, no supplementary ridge above it .. .. *Hemianax ephippiger.*
Genus *Anax*:—
Lateral, supplementary, parallel ridges to segments 4 to 6 3

3 { The thorax laterally, sky-blue marked with an anterior, narrow and a median, broad, black stripe .. .. *Anax immaculifrons.*
The thorax laterally green or pale brown, unmarked 4

4 { Inferior anal appendages half the length of the superior .. .. *Anax guttatus.*
Inferior anal appendages considerable less than half the length of the superior 5

5 { Inferior anal appendages one-third the length of the superior ; a black, T-shaped mark on upper surface of forehead .. .. .. *Anax parthenope bacchus.*
Inferior anal appendages only one-fourth the length of the superior ; no black, T-shaped mark on upper surface of forehead 6

6 { Crest of forehead with a transverse, brown stripe bordered posteriorly with yellow ; membrane white .. .. *Anax parthenope parthenope.*
Crest of forehead with a brown, transverse stripe bordered posteriorly with blue ; membrane black, white at base .. .. .. *Anax parthenope julius.*

7 { Basal space traversed by several nervures 8
Basal space entire 13

8 { Dentigerous plate of female rounded and subdenticulate 9
Dentigerous plate of female forked 12

9 { Genus *Calicæschna* (Persian species) :—
Frons only normally developed .. .. *Calicæschna microstigma.*
Genus *Cephalæschna* :—
Frons remarkably developed 10

10 { Frons projecting markedly, like the bows of a ship ; frons and face yellow without markings .. .. *Cephaælschna acutifrons.*
Frons projecting markedly in a rounded, globular form, pale brown ; face yellow above, black below with two small yellow spots on the labrum .. .. *Cephalæschna orbifrons.*
Frons yellow bordered with black above 11

11 { Frons shiny black in front .. .. .. *Cephalæschna lugubris.*
Frons yellow in front .. .. .. *Cephalæschna masoni.*

12 { Genus *Periæschna* :—
Trigones of forewings long, of 5 to 6 cells ; thorax dark brown marked with bright yellow stripes .. .. *Periæchna magdalenæ.*
Genus *Gynacanthæschna* :—
Trigones of forewings shorter, of 3 to 4 cells only ; thorax brown or black marked with green stripes .. .. *Gynacanthæschna sikkima*

13 { Genus *Jagoria* :—
5th nervure (Rs) unforked .. .. .. *Jagoria martini*
5th nervure forked 14

14 { Genus *Austroæschna* :—
Only 1 row of cells between nervures 5 and 5a (Rs and Rspl) .. .. *Austroæschna intersedens.*
3 to 7 rows of cells between nervures 5 and 5a.. 15

15 { Genus *Anaciæschna* :—
Base of hindwing sub-rounded; 4th nervure making an abrupt curve towards the costa, beneath the stigma as in *Anax* .. .. *Anaciæschna jaspidea.*
Base of hindwing in the male more or less angulated and excavated 16

16 { Genus *Æschna* :—
Dentigerous plate in the female rounded and denticulate or subdenticulate or elongate 17
Genus *Gynacantha* :—
Dentigerous plate in the female prolonged as a two-pronged fork 22

17 { Dentigerous plate in the female elongate and spout-like, the hinder border furnished with a number of long teeth 18
Dentigerous plate in the female rounded and subdenticulate .. 19

18 { Superior anal appendages narrow but broadening widely at the apex and expanded abruptly into a hawk's-bill-like process inferiorly; a robust spine on the dorsum of the 10th abdominal segment .. .. .. *Æschna ornithocephala.*
Superior anal appendages broad and spatulate; only a poorly-developed spine on the dorsum of the 10th abdominal segment .. .. *Æschna erythromelas.*

19 { Antehumeral bands on thorax green 20
Antehumeral bands on thorax bright yellow 21

20 { Sides of thorax entirely green; a small spine on the dorsum of the 10th abdominal segment; appendages narrow and tapering .. *Æschna viridis.*
Sides of thorax with 2 broad, yellow stripes; no spine on the dorsum of 10th abdominal segment; superior anal appendages very broad and leaf-like .. .. *Æschna petalura.*

21 { Very large insects with a total length of about 74 mm.; a sharp, robust and prominent spine on the dorsum of the 10th abdominal segment .. .. *Æschna juncea.*
Smaller insects with a total length of about 64 mm.; only a poorly developed, depressed spine on the dorsum of 10th abdominal segment .. .. *Æschna mixta.*

22 { Inferior anal appendages more than half the length of the superiors .. .. .. *Gynacantha khasiaca.*
Inferior anal appendages less than one-third the length of the superiors, usually one-fourth or one-fifth 23
Inferior anal appendages more than one-third but less than one-half the length of the superiors 24

23 { Superior anal appendages with the basal three-fourths slender, the apical fourth dilated and spatulate-like, the apex slightly rounded .. .. *Gynacantha basiguttata.*
Superior anal appendages with the basal and apical thirds dilated, the middle third a little constricted, the apex pointed .. .. *Gynacantha subinterrupta.*

24 { Abdomen not constricted at the third segment, unmarked save for some green on the first two segments; frons without any markings on its upper surface .. .. .. *Gynacantha millardi.*
Abdomen with at least some slight constriction of the third segment, marked with yellow, green or blue markings on most segments; frons with a blakish T-shaped mark or an anterior bordering of the same colour on its upper surface 25

25 { Superior anal appendages seen from above, markedly sinuous; abdomen only slightly constricted at the 3rd segment; legs reddish.. *Gynacantha furcata.*
Superior anal appendages seen from above, more or less straight; 3rd abdominal segment variable; legs yellow or brown 26

26 { Length of hindwing not more than 35 mm.; abdomen not more than 42 mm. in length; abdomen reddish brown spotted with green; 3rd abdominal segment very constricted .. *Gynacantha saltatrix.*
Length of hindwing not less than 40 mm.; abdomen not less than 45 mm., and usually more than this.. 27

27 { Upper surface of frons with its anterior border blackish brown; antenodal nervures to forewing 18 to 21; 3rd abdominal segment slightly constricted .. .. *Gynacantha bayadera.*
Upper surface of frons with a blackish-brown T-shaped like mark; antenodal nervures to forewing 24 to 34; 3rd abdominal segment markedly constricted 28

28 { Abdomen blackish brown above, reddish beneath, no markings .. .. *Gynacantha hyalina.*
Abdomen black and grey, marked with blue spots 29

29 { Abdomen and hindwing of approximately the same length (about 44 mm).; blue markings on segments 3 to 7 rather obscure .. *Gynacantha hanumana.*
Abdomen longer than the hindwing (50 mm. compared to 47 mm or less; blue marks on segments 3 to 7 well defined .. .. *Gynacantha bainbriggei.*

Group—Anax.

Eyes very large, globular and broadly contiguous; occiput rather small. Wings long and broad, reticulation close, the base of hindwings in both sexes rounded and not excavated; 4th nervure (M2 or nodal sector) making an abrupt

curve towards the costa near outer end of stigma; 5th nervure (Rs or subnodal sector) not forked; stigma long and slender; arcular space entire; membrane long and broad; trigones very elongated, of 4 to 8 cells; border of 10th abdominal segment in the female subrounded and subdenticulate; anal appendages entire, variable but more or less lanceolate in shape; abdomen with or without lateral, accessory, longitudinal ridges on segments 4 to 8.

Only two genera—*Anax* and *Hemianax*.

Genus—Anax, Leach.

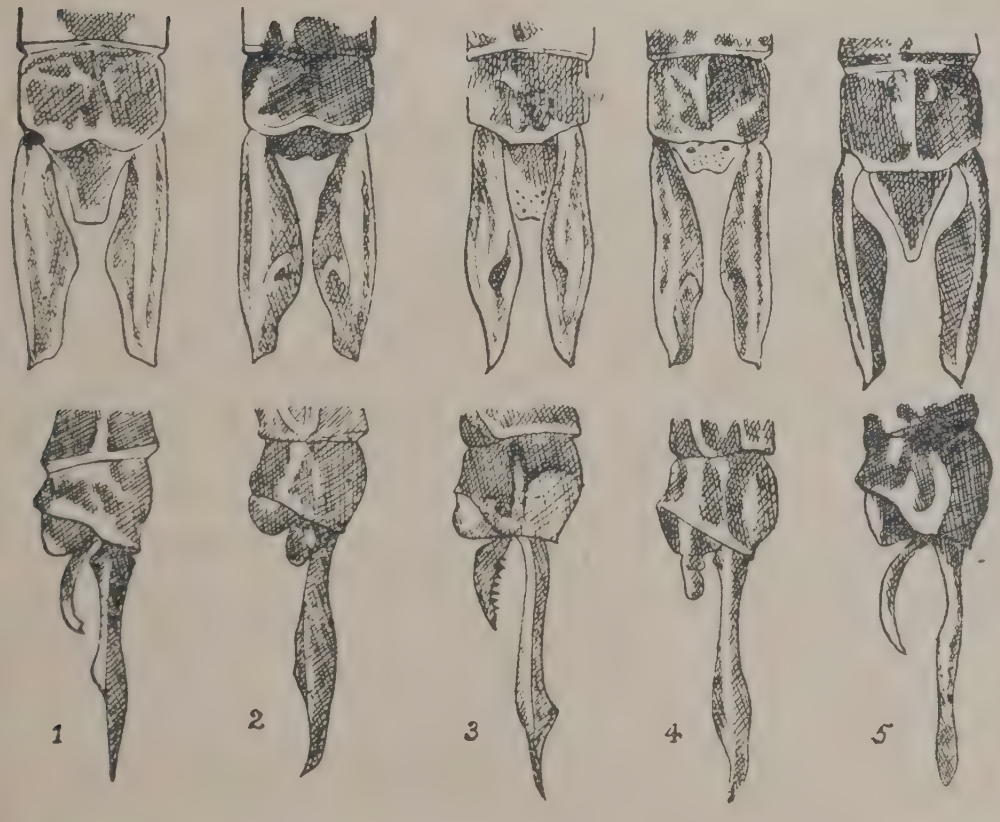


Fig. 3.—Dorsal and lateral aspects of the anal appendages of 1. *Anax guttatus*, 2. *Anax parthenope julius*, 3. *Hemianax ephippiger*, 4. *Anax parthenope parthenope*, 5. *Anax immaculifrons*.

Anax, Leach, Edinb. Encycl. ix, p. 137 (1815).

Æschna, Van der Lind.

Cyrtosoma, Burm. Handb. Ent. ii, p. 839 (1839); Charp. Lib, Eur. p. 13 (1840).

Anax, Ramb. Ins. Nevr. p. 182 (1842); Brauer, Reise d Novara. Neur. p. 59 (1856); Steph. Ill. Brit. Ent. Mand. vi, p. 81 (1836); Selys, Mon. Lib. Eur. p. 113 (1840); id., Rev. Odon. p. 109 (1850); id., Bull. Acad. Belg. (3) v., p. 723 (1883).

Lateral supplementary ridges on abdominal segments 4 to 8; anal superior appendages thick, sublanceolate, hollowed inwardly, with a keel or ridge above, the inferior quadrilateral.

Type. *Anax formosus,* Van der Lind.

1. **Anax immaculifrons,** Ramb. Ins. Neur., p. 189 (1842); Brauer, Reise d Novara, Neur, p. 60 (1866); Kirby, Cat. Odon., p. 84 (1890); Martin, Cat. Coll. Selys, Aeschnines, xix, xx, p. 18, fig. 12 (1909); id., Bull. Soc. Ent. Frn. xii, p. 212 (1909); Ris, Suppl. Ent. No. v, pp. 63-65 (1916); Laid. Rec. Ind., Mus. MS (1921).

Male Abdomen 59 mm., Hindwing 57 mm.
Female Abdomen 57 mm., Hindwing 58 mm.

Male—Head large and globular; eyes a beautiful sea-blue during life, broadly contiguous; labium, labrum, epistome, frons and vesicle all pale bluish green, unmarked; occiput green or bluish green.

Prothorax brown, completely hidden by the overhanging head.

Thorax bulky, matt green on front and dorsum, bright, glossy sky-blue on the sides, which are marked with two jet black stripes, an anterior narrow and a median, oblique broad, both somewhat sinuous. The tergum spotted with blue in the form of a cross.

Wings hyaline, more commonly enfumed and often tinted with yellow for a great part of their area, membrane large, black with a large, basal, white spot; reticulation close, black but many of the nervures at the base of wing, including the lower half of arc and the antenodal nervures of the 2nd series pale yellow; costa yellow; antenodal nervures to the forewing 19 to 21, postnodals 10 to 12, antenodal nervures to hindwing 15, postnodals 12 to 14; trigones in forewing with 6 cells, in hindwing 5; 5 cubital nervures in the forewing, 4 in the hind; 4 to 5 rows of cells between 5 and 5a; stigma braced, narrow and long, dark brown above, paler beneath.

Abdomen tumid at the base, a little constricted at base of 3rd segment, cylindrical and of even width afterwards as far as the anal end. First segment black, 2nd and 3rd sky-blue on the dorsum and sides, the former with a broad, transverse, subbasal, black band broadest on the dorsum and an apical, black ring which extends squarely basalwards along the dorsum but is not usually confluent with the subbasal mark; remaining segments a dirty pale blue or pale yellow with the apical halves or more, black and a small, triangular, dorsal black mark on the paler area which is the analogue of the larger marking seen on the 2nd segment; on the 8th segment, the apical black more extensive and on 9 and 10 the black covers the whole of dorsum, the sides and the apical border of the 10th segment yellowish.

Legs black, robust, long. On the outer side of the hind femora at the distal end, a robust, bifid spur is seen which is less marked on the other femora.

Anal superior appendages brown; seen from above they are narrow at the base, then broadening rather abruptly and widely on the inner side and tapering again gradually to the apex which is rather obtuse, bevelled outwardly to a fine point. A prominent keel runs the length of the upper surface along the outer border. Inferior appendages barely half the length of the superior, broadly triangular and strongly curved in profile. (Fig. 3, V).

Female.—Head: labium, labrum, epistome and frons pale yellowish green and unmarked save for a narrow black bordering to the lips; eyes pale bluish green, greenish yellow below; occiput pale olivaceous.

Thorax sap green on the dorsum, pale greenish yellow on the sides which are marked with a narrow, sinuous, black, posthumeral stripe and a broad, pale brown or darker brown, median stripe which is bordered narrowly in front and behind with black. The metepimeron bordered posteriorly, narrowly with black.

Wings hyaline, their attachments to the thorax ashy; other features as in male.

Abdomen: 1st segment pale brown with an incomplete apical, black ring; 2nd segment pale greenish yellow on dorsum, pale bluish green on sides at the apex and with a narrow, median, black mark on the dorsum; remaining segments a dirty yellow marked with a narrow, triangular, brown, median spot on dorsum of segments 3 to 7 and broad, apical and narrow, basal annules on segments 3 to 8; 9th segment brown at the base and sides only; 10th segment entirely yellowish green or pale yellow. Often the 8th segment is entirely black save for a small, apical spot which broadens laterally but does not meet its fellow over the dorsum.

Dentigerous plate rounded and covered with small denticules.

Anal appendages brown lanceolate, as long as the 2 last abdominal segments. Legs black.

Hab.—Throughout India in the montane and semi-montane areas, somewhat scarce in the North but becoming increasingly common as its distribution is traced southwards. The Western Ghats are its natural habitat, where it is found at any height above 2,000 ft. rarely being taken below that elevation. It breeds freely in all watercourses at Ootacamund and other hill-tops of the Nilgiris. I have taken it not uncommonly in the Poona District and found that it became more common as traced up to Satara and finally Mahableshwar at which latter place (in a restricted locality below the lake) it literally swarms.

Anax immaculifrons is one of our finest species both as regards its size and beauty. It is to be sought for in the beds of rocky mountain streams in which places it has a regular beat of a mile or more, plying restlessly backwards and forwards for hours. It oviposits in deep running water, inserting its eggs into the stems of reeds and whilst doing so is always guarded by the male which hovers above it at a height of 2 to 3 feet. The female engaged in this work will often be submerged almost up to its neck in the water. The larvæ are easily discernible crawling sluggishly along the mud at the bottom of mountain streams, and the exuviæ may be found in such situations clinging to reed stems at the side of the streams.

2. Anax guttatus, Burm.

Brauer, Reise, d. Novara, Neur. p. 62 (1866); Hagen, Verh. Zool. Ges. Wien, xvii., p. 39 (1867); Martin, Coll. Zool. de Selys. Aeschnines (1909); Laidlaw, Ind. Mus. Rec. MS (1921).

Aeschna guttata, Burm. Handb. Ent. ii., p. 840. n. 14 (1839);
Anax magnus, Ramb. Ins. Nevr. p. 182 (1842); Brauer. l. c. p. 62 (1866).

Dr. Laidlaw has split up a number of forms of this insect into three series, A, B and C. Of these, series A is undoubtely the true *Anax guttatus*, of Burmeister, and series B is most probably a local race of the same insect. Series C seems to approach the *parthenope* group and is doubtfully *Anax bacchus*, Hagen. Martin holds this view, as his description of the latter insect evidently tallies with that of Laidlaw's *series C*, and also with specimens of *Anax* which I have received from various parts of the Himalayas and had regarded as *A. bacchus*.

Male.—Abdomen 52 to 56 mm. Hindwing 49 to 52 mm.

Head: labium, labrum, epistome and frons pale yellow or olivaceous, unmarked; eyes sap green above and at the sides, pale yellowish green beneath; vesicle black; occiput black with a spot at its middle and the posterior border yellow.

In some specimens the labrum is bordered with brown; there is no T-shaped mark on the upper surface of the frons.

Prothorax brown, more or less concealed by the overhanging head.

Thorax bulky, sap green, without any markings. The tergum is in some specimens marked with brown.

Legs black, the femora reddish brown, especially the hinder pair.

Wings hyaline, slightly enfumed as a rule and the hinderpair marked broadly with a large, saffronated spot which extends from the outer end of the trigone as far as the 3rd postnodal nervure. This spot is not sharply defined but gradually diffuses near the median nervure in front and quite close to or even meeting the posterior border of the wing.

Nodal index to wings :—	7·17 | 17·9	9·20 | 19·9	9·16 | 16·9
	11·12 | 13·10	10·14 | 12·9	11·11 | 11·11

About 14 cells in the loop; hypertrigones traversed 3 to 4 times; 4 to 6 cells in the trigones; 4 to 5 cubital nervures.

Membrane moderately large, brown or grey and white or yellowish at the base; stigma greyish yellow bordered with dark brown, 5 to 6 mm. length.

Abdomen blackish brown with blue and orange or yellow markings as follows :—1st segment matt green on dorsum or buff coloured in some specimens and always so after death, the apex edged narrowly with dark brown; 2nd segment sky-blue above and at the sides but changing to white below and beneath, the dorsum with two, transverse, linear, black lines, the basal one of which is in the form of two scallops; 3rd segment with its basal half sky-blue, black spotted with orange at the apical half, the black area extending back in a cone-shaped manner into the blue and almost reaching the basal line of the segment; segments 4 to 8 blackish brown, each marked with a pair of small, basal spots of orange, a pair of long, oval, apical, orange spots and finally a pair of similar coloured spots in line with and between these two. On segment 7 and 8 and not infrequently on all segments, the two apical spots coalesce to form an irregular band, and occasionally all three spots are found to join up. On segment 8 the basal spot is very small or missing; segment 9 has a pair of triangular spots and 10 a pair of rounded, orange spots.

Anal superior appendages brown, 5 to 6 mm. in length or equal to the combined length of segments 9 and 10. Inferior appendages rather less than half the length of the superiors. (Fig. 3, i). The superior present a basal spine on the inner side and a flat, projecting ledge on the inner side; the apex is bevelled outwardly and pointed. The inferior appendages are curved up at the apex and end in a blunt point.

The above description is made from a living specimen taken in Bombay and differs somewhat from the description of the type and from others taken further East and North. Dr. Laidlaw's description of his Series B is as follows :—

"Wings. Yellow tinge of hindwings less extensive, extends only as far as level of node. Basal white mark on membrane very small.

Head. A small triangular area in front of vertex is brown.

Abdomen. Black of dorsal surface is much more intense than in A (Type). The spots on the whole are smaller and do not coalesce and they are of a greenish yellow in colour. The basal spots on 7 and 8 are absent, the spot on 9 is small and that of 10 absent. There are no spots below the lateral, accessory carinæ.

Anal appendages similar to Type. Female unknown.

Differs strongly in colour pattern from type and approaches Series C. In other respects it is not very different from A (Type).

Length of hindwing 54 mm., of abdomen 56 mm., of superior appendages 6 mm."

I regard this variety as a local race or variety of *A. guttatus*.

Female—Very similar to the male but differing a little in shape and colour. The abdomen is more tumid and is not constricted at segment 3 as in the male. The whole abdomen tapers gradually from segment 2.

The eyes are pale green, the face and frons yellowish, the latter having a fine, basal, black line.

Abdomen. Segment 1 is reddish buff, segment 2 is only blue for quite a small area on the dorsum, its sides being silvery white. The ground colour is brown rather than black and the spots are larger, less defined and paler in colour and often coalesce.

Anal appendages lanceolate, with a stout mid-rib, brown.

Dentigerous plate rounded and coated with small denticules.

Hab.—Throughout India in the planes and submontane areas except in the dry zones. I have taken specimens in Madras, Ceylon, Bombay and Poona but have not seen it in the C. P. or Bangalore. It is most abundant in the area of country lying between the ghats and the sea on the Western side of India south of Mount Abu. Dr. Annandale has sent me specimens from Barkuda, Ganjam District, where he states that it is common. It may be seen hawking throughout the day along the borders of the Chilka Lake. I have seen the female ovipositing in quite small tanks in Poona and Bombay and have bred out larvæ obtained from a tank not more than 20 feet across. Clean, weedy tanks are the favourite spots to find them. The imago in Poona always emerged punctually at about 10-30 p.m., and the full colours had almost developed by dawn.

The species described by Dr. Laidlaw as Series C, from Assam and Bengal although closely allied to *A. guttatus* are I believe *A. bacchus* and are described as such below, hence I define the limits of true *guttatus* for the present as south of the montane areas of the *Himalayas*. Eastwards it extends into Burma and throughout the Straits and Indo-China.

3. Anax parthenope, "bacchus" Hagen. Verh. zool. bot. Ges. Wien, xvii. p. 34 (1867); Martin, Cat. Coll. Selys, fig. 16, Aeschnines, p. 85 (1909); Kirby. Cat. p. 85 (1890).

Anax guttatus, Series "C", Laid. Rec. Ind. Mus. (1921); Calv. Proc. Acad. Nat. Sci. Philad. pp. 148, 150 (1899).

Male.—Length of abdomen 50 mm., hindwing 48 mm.

Head: eyes in the living state bluish grey; face pale green; labrum and labium yellow, the former more or less bordered with black; vesicle yellow; frons pale green in front, yellowish green above and marked with a broad, black T-shaped mark; occiput black (In specimens from Shillong and the Himalayas, the occiput is straight behind thus differing from *Anax guttatus* in which there is a minute point at the centre. In these specimens also, the colour is brownish black). (In a specimen which I have examined in the British Museum and which is labelled *A. bacchus*, the occiput is greenish yellow, the centre is raised into a pyriform bosse and the free border is laminated, cleft in the middle by a shallow notch, thus forming two laminated scallops. I think however that this specimen is a local race of *A. parthenope julius*.)

Prothorax brown, hidden almost entirely by the overhanging head. The thorax matt green, unmarked save for some occasional bluish spots on the tergum and the sutural lines which are obscurely blackish brown.

Legs black, the anterior femora yellowish at their bases.

Wings hyaline, the costa yellow outwardly, enfumed at the apices and diffusely along the termen as far as the 6th nervure (M3); membrane blackish brown or greyish black, its base not pale as in *guttatus*; stigma dark ochreous with black borders, 5 mm. long; nodal index variable, $\frac{9\cdot16 \mid 16\cdot9 \quad 10\cdot17 \mid 19\cdot10}{11\cdot11 \mid 11\cdot11 \quad 12\cdot12 \mid 12\cdot11}$ trigones 4 to 6 cells, 4 to 5 cubital nervures; hypertrigones traversed 2 to 3 times.

Abdomen. Segment 1 matt green or pale brown, segment 2 sky-blue above and on the upper part of sides, the dorsum marked with a mid-dorsal line of black, connected with two transverse lines of the same colour.

Segment 3 bluish at its base, black for the apical half or two-thirds and with an apical and sometimes with a medial bluish spot on either side ; segments 4 to 8 black spotted with bluish grey or dirty blue, varying in almost every specimen—usually however there is an oval, apical spot and a medial and basal small spot on each side which are never connected up ; the 9th and 10th segments are black, the former with a single bluish spot and the latter either unspotted or with its apex and sides greenish yellow and the borders finely brown.

Anal superior appendages differ somewhat from those of *Anax guttatus*, they are decidedly broader, the middle third projecting markedly inward ; the inferior appendage is square, greyish and with borders diffusely black.

Female very similar to the male and differing as follows :—

Eyes greenish grey in the living state ; abdomen more tumid at the base and not constricted at the third segment as in the male. The blue on the 2nd segment is only evidenced by a small, diffuse area on the dorsum and the sides are silvery yellow ; segment 3 has no trace of blue colouring and the base is greenish yellow.

The spots on the abdomen are greenish yellow in colour, larger and more extensive and there are additional basal, infero-lateral spots on segments 4 to 5 and sometimes also on 6.

Hab.—N. E. Himalayas, Assam, Upper Burma, Missouri and Dehra Dun. *Anax parthenope bacchus* appears to replace *Anax guttatus* in the North of India and bridges the gap between the latter species and *Anax parthenope julius*. It breeds in tanks and oviposits in shallow water.

4. Anax parthenope julius, Brauer.

> Brauer, Verh. Zool. bot. Ges. Wien xvii (1865) ; Reise. d. Novara, Neur. pp. 61, 63 (1866) ; Selys, Odon. du Japon, C. R. Soc. Ent. Belg. xxvii. p. 116 (1883) ; Kirby Cat. Odon. p. 85 (1890).

Length of abdomen 58 mm, of hindwing 55 mm.

Male—Head : labium bright yellow ; labrum the same colour bordered with black ; face and front of frons greenish yellow unmarked save for a small, diffuse brown, transverse spot on lower part of frons where it joins the upper epistome ; frons above finely bordered with black; behind which is a broad turquoise blue band. Posterior half of frons bright yellow marked centrally in front of vesicle by a projecting, subtriangular black spot. Eyes opalescent ; occiput yellow, posterior border a little concave with the concavity bridged across by a thin lamina.

Prothorax yellowish.

Thorax matt green, the alar sinus and the tergum blue, the former finely outlined in black.

Legs black, femora reddish for their basal two-thirds ; coxæ yellow margined with black at their junction with the synthorax.

Wings hyaline, not enfumed or saffronated in any part ; costa yellow as far as the stigma which is ochreous on its upper surface and yellowish beneath and bordered with black, 6 mm. in length ; membrane black, its basal third white ; trigones with 6 cells in the forewing, 4 in the hind ; cubital nervures 5 in forewing; 4 in the hind ; nodal index :— $\frac{10 \cdot 17 \mid 19 \cdot 10}{11 \cdot 12 \mid 12 \cdot 11}$; 14 to 15 cells in the loop.

Abdomen tumid at the base, constricted at the 3rd segment and of even width thereafter as far as the end ; segment 1 yellowish green finely bordered basally with black, two irregular, diffuse, small, brownish spots on each side, one subdorsal, the other nearly ventral ; segment 2 turquoise blue, the dorsum very finely, the base and two transverse, fine lines black ; segments 3 to 8 pale dirty blue, the dorsum of all segments rather broadly black, this colour

prolonged outwardly and finely along all transverse sutures and at the junction of the apical and middle thirds, as a short angular projection. The supplementary ridges and the apical halves of the segments 3 to 6 below these ridges are also black, whilst on segments 7 to 10 the part below the lateral ridges is entirely black; the 9th and 10th segments are broadly black on the dorsum and finely along the lateral and posterior borders.

Superior anal appendages 5 mm. long, dark brown, very similar to *guttatus* but more abruptly narrowed after the middle third. The inferior appendage is barely one-third the length of the superior, quadrate, the end turned up slightly and presenting two teeth at either angle when viewed in profile, pale brown but darker at the borders (Fig. 3, 2).

Female very similar to the male but the abdomen more tumid at the base and not constricted at the third segment. There is only a slight trace of turquoise blue on the dorsum of the 2nd segment and none on that of the 3rd, the sides of these two segments are silvery white.

The markings are almost identical with those of the male on the rest of the segments, but the black is more extensive and tends to cut up the marginal dull blue into spots which however are always coalescent to some extent. The thorax is pale brown or fawny.

Dentigerous plate subdenticulate and rounded.

Anal appendages lanceolate and with a stout mid-rib.

Hab.—Himalayas, Bengal and Assam. The specimens described above are from Darjeeling District. Eastwards it spreads into China and Japan.

Anax julius bridges the gap between *Anax bacchus* and *parthenope*, both of which it resembles somewhat, the colouring of the frons will however suffice to differentiate them.

5. **Anax parthenope parthenope,** Selys, Bull. Acad. Belg. vi. (2) p. 389 (1859); id. Mon. Lib. Eur. p. 119 (1840); id. Rev. Odon. p. 111 (1850); Brauer Reise d. Novara, Neur. p. 61 (1866); Hagen, Neur. N. Amer. p. (1867); Kirby, Cat. Odon p. 85 (1890); Laid Rec. Ind. Mus. MS (1921). Calvert, Proc. Acad. Nat. Sci. Philad. (1898), pp. 148-149, fig. 3 A. t.; Martin, Cat. Coll. Selys, Aeschnines, xix, xx, p. 20 (fig. 15) (1909).

Aeschna parthenope, Selys. loc. cit.

Aeschna parisinus, Ramb. Neurop. p. 185, t. l. f. 10 (1842).

Length of abdomen, male 53 mm, female 50 mm, hindwing 49 to 50 mm.

Male—Head: labium, labrum and face as well as front of frons cinereous, whitish or very pale yellow; upper surface of frons marked anteriorly with a broad, blackish brown, transverse band, posterior to which is a narrow line of pale brown followed again by a band of pale blue. Base of frons bluish with a very small, black triangle in the suture in front of vesicle; the latter black in front, pale yellow or whitish yellow above; occiput bright yellow behind but with a small, black, triangular area in front.

Prothorax pale brown, almost entirely obscured by the overlapping head.

Thorax pale brown or greyish or faintly tinted with greenish yellow. In Basra specimens the colour is a pale slate blue and the only markings are the sutures which are finely outlined in black.

Legs black, the middle and posterior pairs of femora reddish, the anterior pair black outwardly, pale whitish yellow inwardly. The middle and posterior femora with a row of very closely-set, very small even spines, the distal few slightly more robust.

Wings hyaline or partially enfumed, often quite deeply so. In one specimen from Basra the extreme tips of the wings are enfumed and the outer two-thirds, from the outer end of the trigone to rather beyond the stigma is a smoky amber tint; in other specimens the wings have a deeply enfumed, brownish area

beginning diffusely from distal to or proximal to the node and ending rather abruptly at the level of the outer end of stigma. This fascia is very noticeable when the insect is flying and is always much more extensive in the females. If present in the males it is usually more amber tinted. Stigma pale brown above, whitish yellow beneath, 4·0 to 5·5 mm. in length and larger in the female; membrane white ; trigones with 4 to 6 cells in the forewing, 3 to 4 in the hind ; cubital nervures 4 in all wings ; nodal index :— $\frac{7\cdot15 \mid 16\cdot8}{9\cdot11 \mid 10\cdot9}$, $\frac{8\cdot14 \mid 14\cdot8}{11\cdot12 \mid 11\cdot10}$, $\frac{11\cdot18 \mid 17\cdot11}{11\cdot11 \mid 11\cdot12}$, $\frac{8\cdot15 \mid 15\cdot8}{10\cdot10 \mid 10\cdot9}$; 13 to 14 cells in the loop.

Abdomen tumid at the base, well constricted at the 3rd segment and very gradually enlarging thereafter as far as the anal end. 1st segment pale buff, darker brown on the dorsum and with a pruinescent, dark round spot on the side; 2nd segment pale turquoise blue, marked with a fine apical and a basal black ring. There is also a small transverse, linear, black mark on either side of the dorsum, distal to the middle of the segment. The dorsum more or less spiny and black, this colour usually limited to the minute spines. A black spot on the side represents the rudimentary auricle ; 3rd segment turquoise blue for rather more than its basal half, white low down on the sides and brownish black for the apical third or more and here marked with three conjoined, dirty blue, elongate spots, somewhat irregular in shape, the brown on the dorsum spreads basalwards into the blue almost up to the base of the segment; segments 4 to 8 blackish brown on the dorsum, pale blue at the sides, the dark dorsal colouring invading it along the transverse sutures and by a triangular point near the apex, the supplementary ridges are finely brown, as is also the apical area beneath them ; segment 9 is broadly black on the dorsum and blue at the sides, its lateral borders finely black ; 10 is brownish black with the sides and apical border yellowish.

Anal superior appendages nearly as long as the 9th and 10th segments taken together, dark brown, the apices paler inwardly. Evenly convex on the inner side for the basal three-fourths and the apex rather abruptly narrowed and with a small point on the outer side.

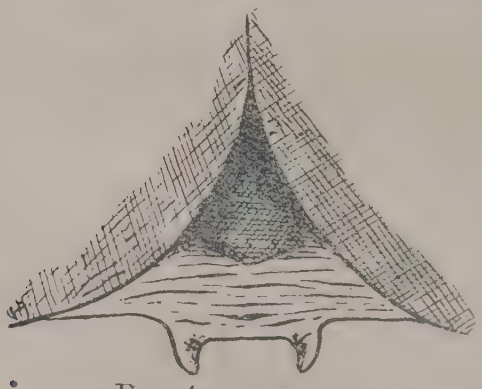


Fig. 4.
Occiput of *Anax parthenope parthenope*, female.

Inferior appendage white with brown borders, less than one-fourth the length of the superiors, its apical border with numerous fine spines directed upward (Fig. 3, 4).

Female very similar to the male but with a stouter abdomen and no constriction of the 3rd segment. Differs as follows :—Labrum bordered with brown ; frons in front has a narrow, reddish brown bordering, above a bordering of dull blue and the base pale blue. There is no basal, black, triangular spot. Occiput very highly specialized, shiny black in front, bright yellow posteriorly, the posterior border projects backward slightly as a quadrate lobe furnished with a small horn at either angle. (fig. 4). The blue on abdominal segments 2 and 3 is restricted to but a small area on the dorsum and the sides of these segments are silvery white. The 10th segment is entirely yellow save for a small, black, dorsal mark at the base.

Anal appendages brown, lanceolate, rapidly tapering to a point, with a strong mid-rib running throughout their length. Dentigerous plate rounded, its posterior border straight and its surface coated with minute denticules.

Hab.—Mesopotamia, India throughout the Deccan, Rajputana and Sind. I have found it breeding in small tanks in Poona. Elsewhere it is found throughout the Mediterranean, and Asia Minor and the Near East.

Genus HEMIANAX, Burm.

Hemianax, Selys, Bull. Acad. Belg. (3) v. p. 723 (1883); Kirby, Cat. Odon. p. 85 (1890); Martin, Cat. Coll. Selys, Aeschnines, xix, xx; p. 80 (1909); Tillyard, J. L. Soc. Lond. Zool. xxxiii, July (1916), Laid. Rec. Ind. Mus. MS. (1921).

Cyrtosoma, Selys, Trans. Ent. Soc. Lond. p. 412 (1871).

Æschna, Van der Lind.

Very similar to genus *Anax* but generally smaller and with shorter abdomen. The latter has no supplementary ridges on the sides of segments 4 to 8 and is therefore smooth and cylindrical.

The superior anal appendages are sublanceolate in the male and taper more rapidly than in *Anax*, in the female they are typically lanceolate. Inferior anal appendages subtriangular and with the lateral borders furnished with robust imbricated spines. (Selys aptly described this appendages as resembling the lower jaw of a python with its imbricated teeth.)

Wings similar to genus *Anax*.

7. **Hemianax ephippiger**—Burmeister, (Aeschna ephippiger), Handbk. Ent. ii. p. 840. n. 15 (1839).

Anax ephippiger, Brauer, Reise. d. Novara, Neur. p. 63 (1866); Hagen, Verh. Zool. bot. Ges. Wien, xvii, p. 21 (1867).

Æschna mediterranea, Selys, Bull. Acad. Belg. vi. (2) p. 391 (1839).

Anax mediterranea, Selys, Mon. Lib. Eur. p. 120 (1840).

Anax mediterraneus, Selys, Rev. Odon. p. 329 (1850); Brauer, loc. cit. p. 63 (1866).

Anax senegalensis, Ramb. Ins. Nevr. p. 190 (1842).

Length of abdomen 45 to 48 mm, of hindwing 45 to 46 mm.

Male—Head: eyes sage green above changing to yellow beneath; labium bright yellow; labrum and face greenish yellow; frons bright yellow, its anterior border and front blackish brown, its base very narrowly black before the eyes and vesicle; vesicle yellow with a blackish base; occiput greenish yellow, slightly concave behind and raised in a medial ridge in continuation of the opthalmic suture. Eyes behind black and marked with bright yellow.

Prothorax yellowish.

Thorax pale ochreous brown or sage green on the dorsum, greenish yellow on the sides, the metepimeron sometimes a bluish green. No markings save for a fine black belt bordering the coxæ.

Legs black, base of hind femora reddish brown, anterior femora bright yellow behind, and within, black in front. Hind femora with a row of closely-set, gradually lengthening, but short spines.

Wings hyaline but with a diffuse saffronated spot in the hindwing very similar to that seen in *guttatus* extending from the trigone to well beyond the node. Much smaller and often entirely absent in the male. In addition there is some slight saffronation of the bases of the wings, especially in the female; membrane white, its anterior margin narrowly black throughout its length; stigma 5 to 5·5 mm in length, bright ochreous margined posteriorly with dark brown; reticulation black and yellow, the costa yellow as far as apex; trigone of forewing with 5 cells, 4 in the hind, narrower than in *Anax*; 5 cubital nervures in the forewing, 4 in the hind; 10 to 14 cells in the loop.

Nodal index—Male :— $\frac{8\cdot15 \mid 16\cdot7}{9\cdot10 \mid 11\cdot9}$, Female $\frac{7\cdot14 \mid 15\cdot7}{10\cdot11 \mid 11\cdot10}$, $\frac{7\cdot16 \mid 16\cdot7}{10\cdot10 \mid 10\cdot10}$

Abdomen tumid at the base, a little constricted at the 3rd segment and from thence of even width as far as the anal end, the 9th and 10th being slightly broadened. Cylindrical and smooth due to the absence of the supplementary ridges on the sides. Ground colour ochreous on the dorsum changing to olivaceous or greenish yellow on the sides and beneath. 1st segment brown on the dorsum, this colour extending out as a transverse median line and also along the apical margin. Space between the 1st and 2nd segments greenish yellow. The dorsum of the 2nd segment turquoise blue, its apex finely and base rather more broadly black or dark brown, its sides silvery white ; the dorsum of segments 3 to 7 irregularly and narrowly brownish black and with a small, lateral, diffuse brownish spot at the lower part of the apical half ; on 8 and 9 this spot extends basalwards and joins up with the black of dorsum which is much more extensive on these two segments, and thus encloses a large spot of the ground colour, on segment 8 there is also a smaller spot enclosed at the base ; 10th segment has a single, large apical spot on each side, connected across the dorsum apically with each other.

Anal superior appendages as long as the 9th and 10th segments taken together lanceolate, tapered to a fine point, strongly keeled, the keel raised into a robust, spinous process near the apex of the appendix, very prominent when viewed from the side, reddish brown. Inferior appendage not half the length of the superior, yellow stippled with black bordered laterally above with several, robust imbricated, black spines.

Female very similar to the male but differing as follows :—

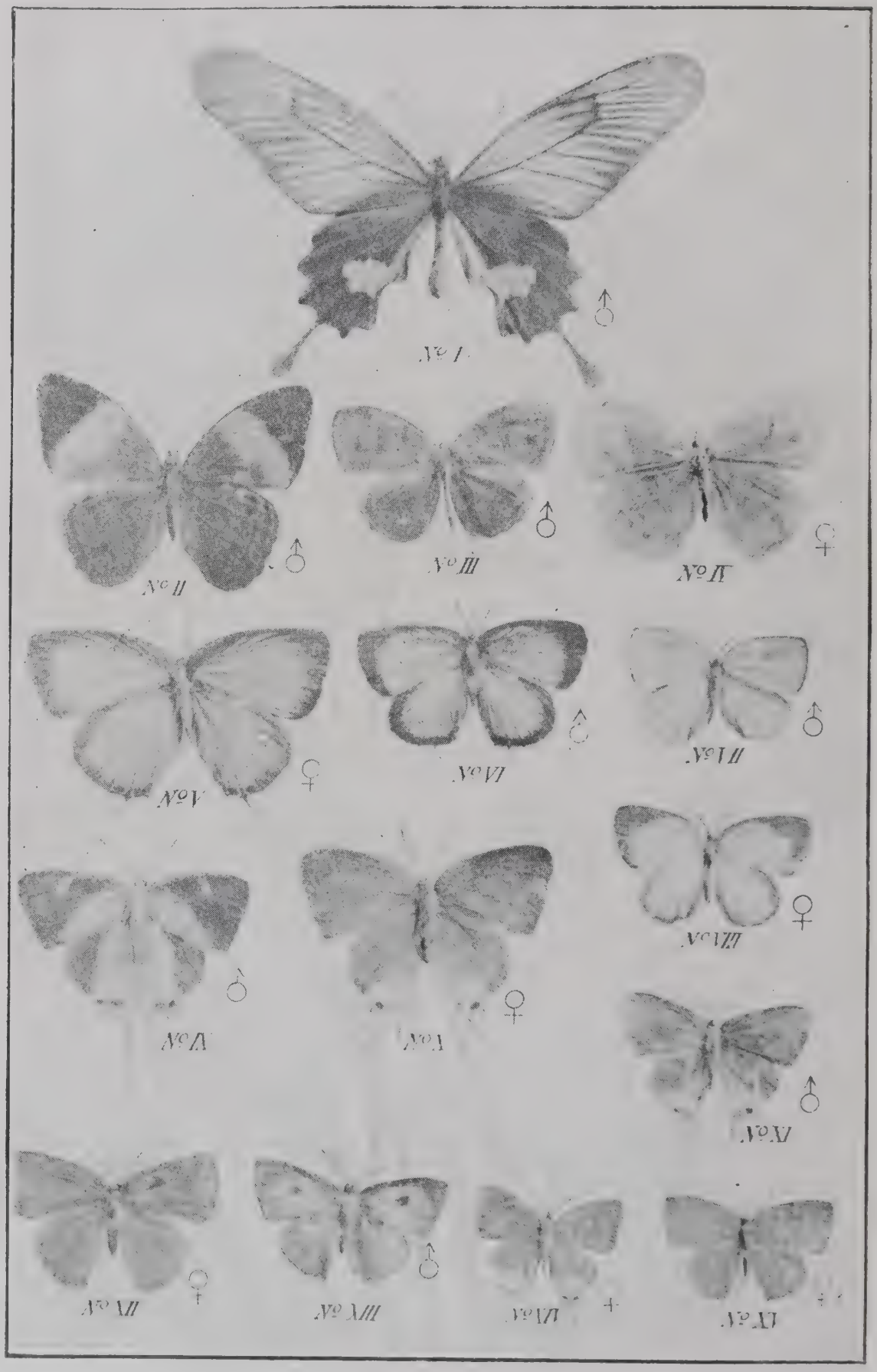
The occiput instead of being concave behind, projects back slightly in the form of a fine lamina the edge of which curls slightly up. Above it is raised into a pyriform, shiny bosse, the broad, rounded end of which is sharply marked off from the laminated, posterior portion.

The abdomen is more tumid, the 3rd segment not constricted but tapering gradually to the anal end ; the 2nd segment has only a small spot of turquoise blue on its anterior third ; the sides of the 3rd segment more broadly white ; the black markings less extensive on segments 3 to 7.

The anal appendages more typically lanceolate and with a strong keel running throughout their length and not raised in a tubercle or spine near the apex. Dentigerous plate very similar to that of *Anax parthenope parthenope*, rounded and subdenticulate.

Hab.—Mesopotamia, Persia, North Africa, India throughout the plains and dry areas, more especially Sind, Gujerat, Rajputana and parts of the Deccan. This species is given to long migrant flights, often swarming in great numbers. I saw one such on the 20th November 1919 when at sea, some 40 miles off the Kathiawar Coast. All the specimens taken on board the ship were fresh, and some quite teneral. In Mesopotamia it breeds in irrigation canals and marshes, whilst in India I have found it breeding in small tanks. It is interesting to note that a close observer like De Selys when describing this species (under the name of *Anax mediterraneus*) quite overlooked the absence of the supplementary ridges on the abdomen which are so serviceable for identifying the insect.

(*To be continued.*)



Butterflies of Tavoy.

A LIST OF BUTTERFLIES COLLECTED IN THE TAVOY DISTRICT, BURMA.

BY

O. C. OLLENBACH.

(*With a Plate*).

(*Continued from page* 897, *Vol. XXVII.*)

Family—LYCÆNIDÆ.

Subfamily—GERYDINÆ.

218. *Gerydus boisduvalii*, Moore.
Plentiful on the hills almost all the year round.

219. *Gerydus ancon*, Doh.
Several specimens of both sexes taken. It appears to be on the wing throughout the year as I have specimens which were caught in January, April, August, September and December. It keeps mostly to the hills.

220. *Gerydus croton*, Sp.
Near to Croton, but differs in the band on the upperside of the forewings being pure white and extending from near the costa to the 2nd median nervule. On the underside the ground colour is lighter than the typical form. Four males were taken on Sinbo Sinma in October 1918.

221. *Gerydus biggsii*, Dist.
A pair taken on Pagaye hill, 600,′ on 22nd May 1916.

222. *Allotinus subviolaceus*, Felder.
A single male taken on Pagaye hill, 6,000,′ on 30th December 1917.

223. *Allotinus horsfieldii*, Moore.
Plentiful on the hills from November to April.

Subfamily—LYCÆNINÆ.

224. *Pithecops hylax*, Fab.
Common at all elevations in heavy jungle throughout the year.

225. *Neopithecops zalmora*, Butler.
Common on the hills and along streams in all parts of the district.

226. *Spalgis epius*, Wd.
A few specimens taken at Myitta and Pagaye during December.

227. *Taraka hamada*, Druce.
This is not a common species and has been taken sparingly at Myitta in May and at Myekhanba in December.

228. *Cyaniris puspa*, Hors.
Common on hill-tops during December and January, and along streams at the foot of the hills from February to June.

229. *Catachrysops strabo*, Fab.
One of the commonest of butterflies and seen in greatest numbers during December and January.

230. *Catachrysops pandava*, Hors.
Common all the year round, throughout the district.

231. *Catachrysops cnejus*, Fab.
Found sparingly throughout the district.

232. *Castalius rosimon*, Fab.
Common throughout the year ; very plentiful from December to April.

233. *Castalius ethion*, Db.
Plentiful on the hills from December to March and found sparingly during the rest of the year.
234. *Castalius roxus*, God.
A few specimens taken at Pagaye during November.
235. *Castalius decidia*, Hew.
Very scarce ; only two specimens taken at Pagaye in December 1916.
236. *Castalius elna*, Hew.
Common at all times throughout the district in hilly country.
237. *Lycœnesthes lycœnina*, Felder.
A very common species which appears in large numbers, on hill-tops, from January to May.
238. *Lycœnesthes emolus*, God.
Common on the hills all the year round.
239. *Nacaduba atrata*, Hors.
A fair number of both sexes taken at Kambauk and Pagaye in January.
240. *Nacaduba pavana*, Hors.
Plentiful especially on the hills throughout the year.
241. *Nacaduba nora*, Felder.
Very common from November to January but less so during the rest of the year.
242. *Nacaduba plumbeomicans*, DeN.
Males very common but females less so. This species is very plentiful on the hills during December and January.
243. *Lampides bochus*, Cramer.
Found sparingly on the hills from December to April. Females are decidedly rare.
244. *Lampides subdita*, Moore.
A few taken at Myitta and Pagaye in May 1916 and several specimens of both sexes taken on Sabataung, 400′, in December 1919.
245. *Lampides celeno*, Cramer.
Very common at all elevations throughout the district and at all seasons.
246. *Lampides kondulana cœrulea*, Sw.
A few males and two females taken at Pagaye, Kalachaung and Kalataung. This is a rare species but appears to fly all the year round as I have specimens taken in March, April, August, November, and December.
247. *Lampides elpis*, God.
Very common all over the district at all seasons.
248. *Polyommatus bœticus*, L.
Extremely common at all times at low elevations. During November and December they appear in vast numbers.

Subfamily—Poritiinæ.

249. *Poritia hewitsoni tavoyana*, Doh.
A few males but no females taken during December on Pagaye hill, 600′.
250. *Poritia pleurata*, Hew.
A rare species ; two males and four females taken on Pagaye hill, 600′, and on Kalataung, 1,500′, during December 1920.
251. *Poritia phraatica*, Hew.
About 40 miles and 35 females were taken on Pagaye hill, 600′, and on Kalataung, 1500′, in December 1919. The males are almost exactly like *P. erycinoides*, from the Karen hills, only the latter is larger. I take these to be the males of *P. phraatica*, the female of which is brown above with large medial orange area on both wings. On the undersides the markings of

the two sexes I caught on Pagaye and Kalataung appear to be the same, only the female has the ground colour whitish. It appears strange that I should have caught so large a number of two opposite sexes and yet for them not to be the opposite sexes of one species. The blue markings on the upperside of the males are very variable, hardly any two specimens being alike. The extent and distribution of the blue colouring of the male is said to be the same as in *P. hewitsoni*, Moore, the difference being that in *P. hewitsoni*, the blue changes to emerald green in some lights ; this I find is not the case as I have three specimens in which the blue does change to green. The males are quite distinct from that sex of *P. hewitsoni* on both surfaces and are easily recognisable.

252. *Poritia phalia*, Hew.

This is a rare species and seldom met with. Seven males and four females only taken on Pagaye and Kalataung, 600′ to 1,500′, between November and February. The males are indistinguishable from the same sex of *P. pediada* on the upper surface, but *P. phalia* is said to be larger. On the underside both are rufous-brown, but *P. phalia* is said to be of a brighter tint. I must have caught well over 20 males of different sizes, so it is difficult to say which are *pediada* and which *phalia*. On examining the undersides I find that the larger specimens are not in every case brighter than the smaller ones and they appear gradually to intergrade. The females of *P. phalia* are yellow and those or pediada, brown, on both surfaces, but the shape of the wings are much alike. The markings on the undersides of the females are the same, the only difference being the colour.

I am much inclined to think that these two species are one and the same and that the female is dimorphic. The distribution of the markings and colouring on the uppersurfaces of the males is very variable and it does not seem possible to distinguish between the males of these two species.

253. *Poritia pediada*, Hew.

Several males and a few females taken on Pagaye hill, 600, and on Kalataung, 1,500′, during December and January 1919-20. As noted previously I am unable to distinguish between these males and those of *P. phalia*. The females of course are brown and appear to mimic *abisara echerius angulata*, Moore.

254. *Poritia phalena*, Hew.

Of this species I have only been able to secure a pair ; the male on Pagaye hill, 600′, on 23rd November 1917, and the female on 22nd December 1919, on Kalataung, 1,500′. The male on the upperside has the spots lustrous sea-green in some lights and blue in others. The shape and disposition of the markings are the same as in *P. phalia* and *P. pediada*, but it differs entirely on the underside in that it has a broad white band crossing both wings, about the middle, besides which there are several whitish transverse streaks on the forewings and the rufous-brown markings on the hindwings are outlined with white. The tuft of long appressed hairs on the pale costal area on the upperside of the hindwings is not peculiar to this species but is also possessed by the other two species mentioned above. The female is brown above as in that sex of *P. pediada*, Hew., but on the underside it is rufous, rather paler than the male. The broad white fascia on the underside of the male is replaced by a narrow whitish line across the forewings only. The whitish transverse streaks on forewings and the white edging to the rufous-brown markings on the hindwings are wanting.

255. *Zarona jasoda*, DeN.

A rare species of which only three males and four females have been caught ; a male at Yeawing in February 1919 ; two males and two females on Pagaye hill, 600′, in December and two females on Kalataung, 1,500′, in December 1919.

Subfamily—CURETINÆ.

256. *Curetis bulis,* Db. and Hew.

Males very common but females are scarce. Numerous specimens were taken in the Kalachaung in February 1919 and at Pagaye and at Wagon in January 1920. I have not secured any specimens of the varieties *angulata* or *discalis.*

257. *Curetis bulis malayica,* Felder.

A few of both sexes taken at Pagaye in December and at Myekhanbaw in April 1919.

Subfamily—THECLINÆ.

258. *Aphnœus lohita,* Hors.

Found mostly at low elevations. It was plentiful along the Pachaung-Kambauk road, on the flowers of the *Aduratum.* The females are not so common and are heavily marked on the underside.

259. *Aphnœus ictis maximus,* El.

Taken very sparingly at Pagaye and Wagon during December 1919.

Subfamily—ARHOPALINÆ.

260. *Mahathala ameria,* Hew.

This is apparently a rare species as only two males and a single female were taken at Myekhanbaw on 23rd May 1919.

261. *Apporosa atkinsoni,* Hew.

A few of both sexes taken at Myekhanbaw in May 1919 and numerous specimens on Sabataung, 300′, in December 1919. This species appears to be very local, being found only at one particular spot at each of the above localities. It keeps to small bushes and flies little, even when disturbed.

262. *Iraota rochana,* Hors.

Many males taken on Pagaye hill, 500′, in bamboo jungle, during December 1919, but no females were seen here. The single female taken was caught about five miles out of Kambauk, on the road to Pachaung, on 19th January 1920. There appears to be no difference between these and *I. boswelliana* Distant.

263. *Amblypodia narada,* Hors.

An uncommon species of which I secured only three males and two females. A pair at Talaingya in October 1914, a pair at Pagaye, 300′, and a female at Wagon, 1,000′, in December 1919.

264. *Surendra quercetorum,* Moore.

Plentiful all over in heavy forest.

265. *Surendra florimel,* Doh.

Rather an uncommon species. Two males taken on Kalataung, 1,500′, at the end of December 1919 and a female at Kambauk in January 1920.

266. *Arhopala centaurus,* Fab.

Very common at low elevations, less so on the hills. It appeared in large numbers on the lower slopes of Sabataung during December 1919.

267. *Arhopala camdeo,* Varro.

Two females only taken ; one on Pagaye hill on 16th December 1919 and the other at Pachaung on 11th January 1920. These specimens are a good deal smaller than the Indian form and the colour on the upper side of the wings is a bright, shining blue.

268. *Arhopala albopunctata,* Hew.

A common species found at all elevations in heavy forest. It is most plentiful from November to March.

269. *Arhopala aida*, DeN.

A male and two females taken, the male at Yeawing on 27th February 1919 and the females on Kalataung, 1,700′, on 21st December 1919.

Female. Expanse 1·6—1·8 inches.

Upperside: Forewing bright rich purple, the costal margin very broadly, increasingly to the apex, thence decreasingly to the anal angle, black; a black spot on the disco-cellulars. Hindwing, the costal margin very widely, the exterior margin less so, black, abdominal margin broadly pale fuscus, anal lobe black with a tuft of white hair at the apex: tail black, tipped with white. The margins of the hindwings are very wide so that the purple colour is confined to the middle portion and appears as a large spot. Underside as in male.

270. *Arhopala vihara*, Felder.

A single male taken at Yeawing, 300′, in February 1919.

270. *Arhopala silhetensis*, Hew.

Two males and a female of this rare species were taken. A male on Sabataung, 300′, in January 1920, one in Mergui district in February and a female at Myekhanbaw in April 1920. These specimens agree exactly with *A. arama*, DeN., which Bethune Baker places as a synonym of *silhetensis*. The males are darker than the Sikkim specimens in my collection, but the black borders are narrower.

272. *Arhopala anthelus*, Db. & Hew.

Several males and females of this magnificent species were taken at Kalachaung in April 1919, and also on Kalataung, 1,500′, during the last week of December 1919.

273. *Arhopala subfasciata*, Moore.

Very common everywhere in heavy forest, but good specimens are difficult to get.

274. *Arhopala agaba*, Hew.

Rather a common species, found on the hills in heavy forest. Numerous specimens of both sexes were taken at Pagaye, Kalataung and Sabataung during December 1919.

275. *Arhopala selta*, Hew.

A rare species of which I took a female at Yeawing, 300′, on 28th February 1919, a pair on Kalataung, 1,700′, and a male at Pagaye, 600′, during December 1919.

276. *Arhopala rafflesii*, DeN.

Two males only taken; one in the Mergui district in February and the other at Kalachaung in March 1919.

277. *Arhopala aroa*, Hew.

Five males and four females were taken on Kalataung, 1,500′, on 22nd December 1919 and a few at Pagaye and Myekhanbaw during December and April respectively.

278. *Arhopala atosia aricia*, Std.

Three males and two females taken during December and January 1919-20; a female at Pagaye, 600′, a pair on Kambauk hill, 500′, and two males at Yeawing, 300′.

279. *Arhopala moolaiana*, Moore.

This species was quite plentiful on the hill to the east of Yeawing during February 1919. I also took many specimens at Pagaye, Wagon and Kambauk, in December and January 1919-20. During the heat of the day they descend to the streams and settle on damp patches of sand.

280. *Arhopala antimuta*, Felder.

A single female taken on Kalataung, 1,700′, on 22nd December 1919.

281. *Arhopala hypomuta*, Hew.

A common species of which a large series was secured. It is found on all the hills throughout the district from December to March.

282. *Arhopala metamuta*, Hew.

Taken sparingly at Pagaye, Sabataung and Wagon, on hill-tops, during December and January.

283. *Arhopala pagaiensis*, n. sp. ♂ No. VII, ♀ No. VIII in plate.

Expanse ♂ 1·6, ♀ 1·4 inches.

Description :—Male :—Upper side both wings brilliant morpho blue, changing to dull purple in certain lights, the costa and outer margins very narrowly black, cilia dusky, the abdominal margin pale fuscus. Underside brown, the spots darker and defined with pale lines. Forewing with a small round spot at base of cell, a larger oval one in the middle and a still larger one at end of cell ; a discal fascia composed of five round spots of equal size placed three and two, the two, which are the lower, shifted inwards, a submarginal series of diffused spots; cilia brown. The area below the median nervure and first median nervule paler than the rest of the wing. Hindwings brown, three small round basal spots, a small spot on the costa, a large oval spot in the cell with a still larger round spot below ; a very large quadrate spot at end of cell. A discal series of spots, commencing at the costa, a little beyond the middle and ending on the abdominal margin, composed of eight spots, the first six rounded, the last two linear; this fascia is strongly broken at the fifth spot, which is shifted inwards a submarginal series of diffused spots ; three marginal black spots crowned with brilliant metallic green scales, the middle spot the largest ; anal lobe small, black ; body above dark brown beneath whitish. Female :—Upperside light, shining blue, the margins broadly brown. Forewing, the costa increasing to the apex, where it is very wide, about a third of the wing, and the outer margin decreasingly broadly fuscus. Hindwing : the costal margin broadly and exterior margin less broadly fuscus. Underside as in male.

284. *Arhopala oberthuri*, Std.

Several specimens of both sexes taken on Kalataung, 1,700′, and on Pagaye hill 600′, during December and January 1919-20.

285. *Arhopala cumolphus fraquhari*, Dist.

Males extremely common on hill-tops especially so on Pagaye hill, 600′, but females are very scarce. During December and the early part of January 1919-20, this butterfly appeared in great numbers on the top of Pagaye hill. They always put in an appearance about 4 p.m. and could be seen sitting with out spread wings on the leaves of trees in patches of sunlight. They indulge in much fighting, not only among themselves, but with any other insect that happens to pass by and in this respect are very different to the other members of this genus. The flash of metalic green from their wings as they flitted about in the rays of the sun was a fine sight and could be seen from a distance.

286. *Arhopala diardi*, Hew.

Several specimens of both sexes were caught on Sabataung, 400′, and also on Kalataung, 1,500′, during December 1919.

287. *Arhopala anniella*, Hew.

An uncommon species of which I secured several males and a few females at Kalachaung in March 1917 and on Pagaye hill, 600′, in December 1919. It appears to be identical with *A. artegal*, Doh., and is near to *A. chinensis*, Felder = *A. moelleri*, DeN., which latter is probably only the Indian form. The shape of the forewings in the males appear to vary to some extent, as I have two specimens in which the fore wings are elongated and pointed at the apex.

288. *Arhopala abseus*, Hew.

Several specimens taken at Pagaye and Kalataung during December 1919. The males on the upperside are coloured like Ceylon specimens, but the black borders are narrower. The females are like the Indian form and are typical.

289. *Arhopala fulgida*, Hew.

A single male taken on Pagaye hill, 600′, on 11th December 1919. This species does not appear to have been recorded from so far South, the habitat being given from Sikkim to Upper Burma.

290. *Arhopala apidanus*, Cramer.

Rather uncommon as only a few specimens of both sexes were taken during December 1919, on Sabataung, 400′, and on Kalataung, 1,700′. One specimen, a female, is exactly like the Assam form *ahamus*, Doh.

91. *Arhopala antura*, Sw.

A single male taken at Maungmagan on 7th April 1914 at about 200′ elevation.

292. *Arhopala agrata*, DeN.

This is an uncommon species as only three males and two females have been taken. All these were caught during December 1919, at Pagaye, 600′, and on Kalataung, 1,500′.

293. *Arhopala œdias*, Hew.

A good many specimens of both sexes were taken on Pagaye hill, 600′, during December and January 1919-20. This species appears to be confined to this particular hill, as I took it nowhere else.

294. *Arhopala woodii*, n. sp. ♂ No. VI in plate.

Expanse ♂ 1·8, ♀ 1·9 inches.

Description.—Male. Upperside, both wings brilliant metallic blue, of about the same shade as in the female of *A. œdias*. Forewing with the costal margin from the base increasing in width to the apex, where it is broadest, ·2 inch, thence decreasing to the tornus, where it is ·05 inch, black and evenly curved inwardly. Hindwing with the costal margin broadly dusky, exterior margin decreasingly to the anal angle, black, abdominal margin broadly fuscus. Anal lobe very small; tail of moderate length, black, tipped with white. Underside, both wings, dull brown, of much the same shade as in *A. œdias*, Hew., the markings of a darker shade, prominent and outwardly defined by a fine pale line. Forewing with the inner margin, broadly paler, up to the median nervure and first median nervule; a small oval spot towards the base of the cell, a large oval spot at the middle, with two small spots below it, in the sub-median interspace, wanting in some specimens, a still larger quadrate spot closing the cell; a large triangular spot at the base of the first median interspace, the discal band composed of six spots, unbroken, macular, but sharply bent towards the costa at vein 4, of even width throughout; a sub-marginal series of diffused spots between the veins. In some specimens there are one to two small diffused spots in the pale area in continuation of the discal band. Hindwing: a very small round spot at extreme base of the costa, four small round spots across base, a sub-costal spot, a spot in the middle of the cell, a large spot posterior to this latter, another spot posterior to the last on the abdominal margin, an elongated spot at the end of the cell; the discal band much dislocated, the two anterior most spots, conjoined, quadrate, and shifted inwards, touching the spot at the end of the cell and the third spot of the discal series. The rest of the discal band consists of six spots which are conjoined and placed in pairs, the posteriormost just touching the spot on the abdominal margin; a submarginal series of diffused spots, as on forewing, anal lobe faint; three black spots on margin, one at anal angle and one on either side of the tail, these spots dusted with metallic green scales. Female, as in male but the costal

dark margin is wider and extends nearly to vein 4, but does not coalesce here with the terminal margin, thus leaving a small blue area. Hindwing on upper and under surfaces as in the male.

295. *Arphola agnis*, Felder.

Three males and two females were taken on Kambauk hill, 300′, about the middle of January 1920. It appears to be rare and was not seen anywhere else.

296. *Arphola hewitsoni*, B.B.

A common species of which I secured a large series. It is to be found on all the hills from November to May.

297. *Arhopala azata*, DeN.

A single male taken on Pagaye hill, 600′, on 7th January 1920. This species was described from the Malay Peninsula, and has so far not been recorded from the Indian region. Upperside both wings pale purple. Forewing has the outer margin very narrowly black ; the discocellulars defined by a narrow dark line. Hindwing has the exterior margin narrowly black, the anal lobe black sprinkled with grey. Tail about $\frac{1}{8}$ inch long, black, tipped with white. Underside : Forewing greyish-brown, the spots of a darker shade, annular and outlined with white. Two spots within the cell, the basal one small, the central one large and oval, with a larger spot at the end of the cell, a spot below the cell in the first median interspace with a larger spot below it in the submedian area. A discal series of eight spots, the first minuae on the costa, the next three, subequal, in line and shifted upwards, followed by four spots, shifted inwards and in line with the first ; a postdiscal and submarginal lunular whitish band. Hindwing with three basal and three discal annular spots, a large quadrate discocellular spot, a discal band of eight spots, in pairs, all outlined with white. Postdiscal and submarginal lunulated bands, whitish. Expanse ♂ 1·3 inches.

298. *Arhopala* Sp. ♀ No. V. in plate.

Expanse : female two inches. Upperside ; purplish blue. Forewing with the costal and outer margins, especially at the apex, broadly fuscus, this margin decreasing in width to the anal angle. Hindwing with the costal and outer margins, moderately broadly fuscus, and also decreasing in width to the anal angle ; tail fuscus, tipped with white ; adbominal marginal whitish ; anal lobe small but distinct. Underside : pale brown, the spots of a much darker shade and outwardly defined with a pale line ; a small round spot at base of cell, a large oval one in the middle with two small spots above, between it and the costa, the lower spot of the two is attached to the spot in the middle of the cell ; a large ill-shaped spot at the end of the cell, with two small spots above it and attached to it, making in all four small spots above the cell ; the usual discal band represented by four oval spots, in pairs, the upper pair placed obliquely on the disc, between the end of the cell and outer margin ; the lower pair shifted inwards and separated by the 2nd median nervule ; an elongated spot beneath the cell, between the bases of the 2nd and 1st median nervules ; two large spots in the submedian interspace one below the middle of the cell and the other at the base of the wings ; a submarginal series of diffused spots ; a large pale area below the cell and the first median nervule. Hindwing : five basal spots, the middle one being at the base of the cell ; a large oval spot in the middle of the cell with a large spot above it, a quadrate spot on costal margin near apex, a very large spot at end of cell, an oval spot between the bases of the 1st and 2nd median nervules and a large cordate spot in the submedian area ; a discal series of five sub-quadrate spots the first two on the disc, about midway between the end of the cell and the outer margin, the next two shifted inwards and separated by the 2nd median nervule, the fifth shifted still further inwards in the first median interspace ; submarginal band as

on forewing; three black anal spots, the two outer crowned inwardly with metallic blue scales, the middle spot entirely covered with similar scales. This is evidently a new species but I hesitate to name it as I have not succeeded in taking a male. It probably belongs to the group *anunda*, Hew., *auxesia*, B.B., *auxea*, DeN., and is near *auxesia*, B.B., but differs from it in the obsolescence of the discal band on the underside of the forewings. It agrees fairly well with *A. agesia*, Hew., the spots on the undersides of both wings being much alike, but it differs from that species in being pale purple on the upperside while *A. agesia* is violet-blue.

299. *Arhopala tunguva*, Gr. S.

Many specimens of both sexes taken on Pagaye hill, during December 1919. This species varies much in size and in the colour of the uppersides.

300. *Arhopala perissa*, Doh.

An uncommon species of which I secured only a few specimens. I took it on Pagaye hill at 600′ and also on Kalataung, 1,700′, in December.

301. *Arhopala perimuta*, Moore.

Plentiful on hill tops throughout the district during January and February, and less so at other times.

302. *Arhopala duessa*, Doh.

Found sparingly from November to March. I have a few specimens of both sexes, of which some were taken at Kalachaung in March and others on Kalataung, 1,500′, during December 1919.

303. *Arhopala ammonides*, Doh.

Several specimens of both sexes of this beautiful little butterfly were caught at Kalachaung in March and Myekhanbaw in April 1920.

304. *Arhopala arvina*, Hew.

Two males and one female taken on Kalataung, 1,700′, on 21st December 1919.

305. *Arhopala adala*, DeN.

A single male taken on Pagaye hill, 600′, during December 1919.

306. *Arhopala fulla*, Hew.

A single female caught on Kambauk hill, 300′, on 14th January 1920. This species has previously been described from the Andaman Islands.

Subfamily—Deudoriginæ.

307. *Deudoryx epijarbas*, Moore.

Common throughout the district.

308. *Hysudra hades*, DeN. ♀ No. XII in plate.

A single female taken about two miles from Kambauk, on the road to Paehaung, on 16th January 1920. De Niceville, J.A.S.B., 1897, p. 500, described this butterfly as "hair brown above, paler on the disc," which is not the case in the specimen I possess which has a distinct cupreous tint on the area below the cell of the forewings, from the base to about three-fourths the length of the wing. There is also a large dark spot in the cell, covering half the area of the same. The hindwings are less cupreous, but this colour is spread over the entire surface.

309. *Rapala sphinx intermedia*, nov. ♂ No. XIII in plate.

Three males and two females were taken on Kalataung, 1,500′, on 22nd and 23rd December 1919. The males on the upperside are exactly as in *Rapala rhoecus*, DeN., but on the underside they agree with *Rapala sphinx*, Fab. My male specimens have the discal band on the forewings, as in *R. rhœcus* and though Swinhoe in *Lep. Indica* sinks *rhœcus* to *sphinx*, he makes no mention of the discal band. On the underside my specimens differ from *rhœcus* in having the ground colour dark brown and not olive green. This is no doubt an undescribed form between *sphinx* and *rhœcus*.

310. *Rapala scintilla*, DeN.

An uncommon species, found sparingly on Pagaye hill, 600′, during the latter part of January. No females were secured.

311. *Rapala varuna*, Hors.

Common on the hills during December and January. Numerous specimens of both sexes were taken at Pagaye, Wagon, Sabataung and Kambauk.

312. *Rapala subguttata*, El. ♀ No. XV in plate.

This appears to be a very local butterfly and has so far been found only on the top of Pagaye hill, 600′. It flies during December and January and is not to be seen for the rest of the year. In all over twenty males have been taken within the last three years, all during December and January. Only one female has been secured, and it was taken on 30th December 1917. As the female is up to the present unknown, I give a description of the same.

Female :—Expanse 1·3 inches.

Upperside : Both wings brown with a purple gloss, much as in the same sex of *Rapala petosiris*, Hew.

Underside : Both wings brown with a pale purple tinge, the outer margins of both wings and the inner margin of forewing somewhat ochreous.

Forewing : A large oval spot in the cell, about its middle, a spot at the end of the cell with two spots just beyond separated by the middle discoidal nervule, two similar spots in the same interspaces, about midway between the apex of cell and outer margin ; two round spots on the disc, on each side of the median nervule, all these spots are dark brown with pale borders.

Hindwing : With three basal spots, the one near the costa about twice as large as either of the other two, a large spot below the costa about the middle of the margin; a very large spot at bend of cell ; a series of six spots across the disc, placed in pairs, commencing on the costa and ending on abdominal margin, all these spots dark brown with light borders. The discal series have light brown centres in addition. A small tail from the tip of the first median nervule, black tipped with white ; anal lobe black, crowned with yellow ; a black spot on margin in the first median interspace, broadly crowned with yellow, a similar spot in the interspace below, sprinkled with grey scales, a short black streak placed along the abdominal margin, bordered with grey. Thorax and abdomen above dark brown, below pale ochreous.

313. *Rapala petosiris*, Hew.

A very common butterfly, found all over the district in heavy jungle.

314. *Rapala suffasa*, Moore.

Fairly plentiful on the hills from November to May. Several specimens of both sexes were taken at Pagaye, Sabataung and Wagon during December and January.

315. *Rapala jarbas*, Fab.

Exceedingly common everywhere ; most plentiful during December and January, females are rather scarce.

316. *Rapala xenophon intermedia*, Std.

Males plentiful on hill tops from November to January but females are scarce. This butterfly varies much on the undersides from pale yellow to dark brown.

317. *Dacalana vidura burmana*, Moore.

An uncommon species and difficult to get in good condition. Taken sparingly at Pagaye, Sabataung, Kambauk and Wagon during December and January. It feeds on the flowers of a species of *Loranthus* and was rather plentiful at Wagon, 1,000′, during the latter part of December 1919. Females were more numerous.

318. *Camena creusa culta*, DeN.
Males taken very sparingly at Pagaye, 600′, during December, but no females were caught.

319. *Camena ictoides*, El.
A few males only taken on Pagaye hill, 600′ in December. These specimens are very like *Camena crethus*, DeN., which was described from Java and Sumatra but the tuft of orange coloured hairs attached to the inner margin of the forewings, on the underside, is small while in *C. creusa* it is large. Also the prominent orange band at the extreme base of the costa in *C. creusa* is wanting in these. It is also very near to *C. carmentalis*, DeN., on the upperside.

320. *Ops æta*, DeN.
A few males and several females were taken at the foot of Sabataung and also at Wagon, 1,000′ during December 1919. It appears to be very local and was not seen anywhere else. It comes to the flowers of a species of *Loranthus* in company with *Dacalana vidura burmana*, Moore, and was fairly plentiful at Wagon, close to the P. W. D. inspection bungalow.

321. *Ops* (*Britomartis*) *cleoboides*, El.
A male and two females taken; the male on Pagaye hill, 600′. in September, one female on Sinbo-Sinma, 4,000′, in October, and the other on Kalataung, 1,500′, in December.

322. *Ops* (*Bullis*) *valentia*, Sw.
A single male taken on Kalataung, 1500′, in December 1919.

323. *Tajuria longinus*, Fab.
Several specimens of both sexes were secured on Sabataung, 300′, during December 1919. These are larger and more strongly marked than is usual.

324. *Tajuria tyro*, DeN.
A pair only taken; the male at Marmagan and the female on Kalataung in December.

325. *Tajuria mantra*, Felder.
Of this rare species I secured two males and one female on Pagaye hill, 600′, in January 1920.

326. *Hypolycaena erylus*, God.
An extremely common butterfly, found at all elevations, throughout the district.

327. *Chliaria othona*, Hew.
Two males taken at Pagaye in April 1917.

328. *Chliaria merguia*, Doh.
A pair taken on Pagaye hill, 600′; the male in April and the female in May.

329. *Thamala miniata*, Moore.
Males pentiful but females are scarce. Numerous males were taken on Pagaye and Penaichaung hills, 500′ to 600′, during December and January 1919-20, but no females were seen there. The few females taken were caught on Kalataung, 1,500′, on 21st and 22nd December 1919. A few males were also taken here and at Kambauk and Yeawing. They are generally found in company with *Rapala xenephon intermedia*, Std., to which they bear a good resemblance.
This butterfly was most plentiful on Penaichaung where I caught over 25 specimens in a single day.

330. *Sithon nedymond*, Cramer.
A rare species and met with very sparingly. It is probably found on all the hill-tops as I have specimens from Pagaye, Yeawing, Maungmagan and Kalataung and is on the wing from October to May.

331. *Araotes lapithis*, Moore.

Three females taken a Maungmagan a little above sea level during December 1919. They keep to heavy jungle and are difficult to catch owing to their swift flight.

332. *Biduanda thesmia*, Hew.

A common species of which a large number of both sexes were secured. It is found on the hills throughout the district and is most plentiful from November to January.

333. *Biduanda thesmia fabricii*, Moore.

Fairly plentiful on the hills in company with *B. thesmia* from which it differs but little in the male sex. The females are very like that sex of *Marmessus lysias*, Fab.

334. *Biduanda melisa*, Hew.

Several males taken on Pagaye hill, 600′, and on Kalataung, 1,500′, from December to May, but only three females were taken at the latter place, on 23rd December 1919. These females have the forewings, on the upperside, brown with a rather large pale yellowish area on the disc ; the anal area of the hindwings is bluish grey. In volume III, page 427, of the Butterflies of India, Burma and Ceylon, by DeNiceville, the female is said, not to differ from the male, except that it has a medial white spot on the forewings, upperside ; this is not the case in the specimens I possess. The females of *B. melisa* and *B. nicevillei*, Doh., are very much alike on both surfaces. On the forewing, upperside *B. melisa* differs in having a large pale area on the disc, the hindwings being almost exactly alike. On the underside the basal spots on both wings in *B. melisa* are annular while in *B. nicevillei* they are simple. They also differ in the discal band on the hindwings, underside, this band in *B. melisa* being entirely composed of fine lines in pairs, while in *B. nicevillei* it has too large quadrate spots near the apex in addition to the fine lines.

335. *Biduanda nicevillei*, Doh. ♀ No. XIV in plate.

Males uncommon but females are very rare. Numerous males were taken on the hills throughout the district but only five females were secured, two on Pagaye hill, 600′, in April and one in December, one at Maungmagan in March and one on Kalataung, 1,500′, in October. As the female is up to the present unknown, I give a description of the same.

Female :— Expanse 1·2 inches. Forewing brown, slightly paler towards the base. Hindwing, brown with three tails, the anal area bluish grey, divided by the dark veins two large lunular spots on the margin, one on each side of the middle tail, a marginal black thread, cilia white, tails white with a dark medial streak. Underside ; both wings white with dark brown markings.

Forewing white, a minute spot at the base of the cell, a small spot beyond and a large spot in the middle of the cell, with a small spot below it, separated by the median nervure, the discocellulars defined by a fine ferruginous line, three subcostal spots, an irregular broad discal fascia commencing at the costa and reaching just beyond the third medial nervule, the outer margin of which is defined with white, a fine ferruginous line in continuation of the fascia with a spot of the same colour placed beside it, a dark quadrate spot below ; apex and outer margin down to third median nervule dark brown, below this the margin is ferruginous ; a submarginal lunular dark brown line ; cilia dark brown. Hindwing with the apical part of the outer margin light ferruginous ; a large round spot in the middle of the cell with many spots and lines round about it ; a discal curved fascia, parallel with the margin, commencing from the costa about, two-thirds from the base, and ending near the abdominal margin, composed of two quadrate dark spots followed by lines in groups

of three ; a submarginal dark brown lunulated line, two anal spots as on upperside, the metallic green anal area larger and brighter than in the male ; black marginal thread and cilia as on upperside.

336. *Marmessus lysias,* Fab.

Very common all over in heavy jungle and at all seasons.

337. *Suasa lisides,* Hew.

Males uncommon but females are very rare. Several males and three females were taken between November and April on hill-tops. Pagaye hill is the best spot for this specie.

338. *Thrix gama,* Dist. ♂ No. XI in plate.

Three males were taken on the top of Pagaye hill, 600′, on 6th January 1920. As this species is new to the Indian region, I give a description of the same.

Male : Expanse 1·4 inches.

Upperside. Forewings fuscus, slightly paler on the disc. Hindwings fuscus, the anal angular area greyish-white and containing two black marginal spots, separated by the first median nervule, a smaller spot at the extreme anal angle ; a marginal blackish line ; tails greyish-white with dark medial lines. A large cupshaped depression on the disc, below the inner margin, shining and very conspicuous in certain lights. Underside. Forewing pale reddish ochraceous with the area beneath the median nervure and first median nervule greyish. A small grey cavity in the middle of the inner margin of the forewing bearing a tuft of orange hairs and placed exactly above the depression on the upperside of the hindwing. Hindwings with the anal augular greyish-white area as above inwardly containing a transverse series of five blackish linear marks, the spots as above, but the middle one very obscure and that at the anal angle larger and brighter, inwardly margined with bluish. Body, above brown, below con-colourous with the wings. Antennæ brown, the tips of the clubs yellow.

339. *Jacoona anasuja,* ♂ No. IX, ♀ No. X in plate.

Two males and three females of this rare species were taken at Pagaye and Sabataung during December 1919.

This species was recorded from Malacca and is new to the Indian region.

Description.—Expanse ♂ 1·8, ♀ 2 inches.

Male. Forewing: Produced somewhat at apex, external margin slightly concave inner margin straight. Hindwing : anal region somewhat produced, a long tail from the tip of the upper internal nervule and an acute tooth at the end of the first median nervule. Upperside, both wings black. Forewing with a large spot of dull cerulean blue from the base to beyond the middle, bounded by the inner margin, very much as in *Charana mandarinus,* Hew.; an oblique fasciole beyond the cell dull cyaneus. Hindwing : the costal border pale fuscus, a large internal area pale cyaneus, the internal groove grey, anal area whitish with two transverse black spots, one on each side of the first median nervule, the spot nearer the tail larger. Tails white, black at the base, the line before the cilia and tooth black. Underside: Forewing ochraceous-hoary, about the outermost part rufescent brownish. Hindwing : The costal and outer margin, the latter as far as the median nervules, pale ochraceous hoary, the rest of the wing whitish. The anal region with a double series of black marks, four in each series, the 2nd and 4th spots of the outer series sprinkled with dull cyaneus scales; tail and tooth as on upperside, tail ·7 inch long.

Female. Upperside : forewing brown immaculate. Hindwing ; brown with a broad whitish band, separating the anal from the middle region, the inner margin of the white band much waved ; three large blackish spots

on the white area, the outermost touching the margin between the 1st and 2nd median nervules, outwardly sprinkled with blue scales, the middle spot shifted inwards and the third at the extreme anal angle also sprinkled with grey scales. There are two tails and an acute tooth; a long tail at tip of upper internal nervule, 1·1 inch long, white with a dark medial streak along its entire length, a small tail emitted from the tip of the first median nervule, about half inch long, white tipped with brown and bearing a dark spot at its base; an acute tooth from the second median nervule, black; scilia white. Underside: much as in the male, but the apex and outer margins of forewings of a brighter tint, the white anal patch margined with a much waved black line; spots as on upperside.

340. *Manto martina*, Hew.

This is a rare species of which I secured three males and two females; a male at Yeawing on 15th May 1915, a pair on Pagaye hill, 600′, in December 1919, and a male at Wagon, 1,000′, on 22nd December 1919. On the underside it is very like *Ticherra acte*, Moore, which may account for it being overlooked.

341. *Cheritra freja*, Fab.

A common species found at all elevations, throughout the district from November to May.

342. *Ticherra acte*, Moore.

Not uncommon and flies in company with the above. The dry and wet season-forms have been both taken.

343. *Zeltus etolus*, Fab.

Very common throughout the district at all seasons.

344. *Bindahara phocides*, Fab.

Rather an uncommon species, found sparingly on the hills during December and January. I took a few specimens of both sexes on Pagaye hill in December 1919.

345. *Loxura atymnus*, Cramer.

Common at all times all through the district.

346. *Yasoda tripunctata*, Hew.

Appears to be a rare species as I have only succeeded in getting a few, a male at Kambauk in January and a female at Maungmagan in April, also a pair at Myekhanbaw in January 1919.

347. *Neomyrina hiemalis*, God and Salve.

This butterfly is quite common but is not found West of Pagaye. It is most plentiful during December but is difficult to catch, and good specimens are seldom taken. During December 1919 it appeared in great numbers on Pagaye hill. It keeps to bamboo jungle and flies high, but on a good windy day it comes down for shelter and can be taken in fair numbers. It settles on the underside of leave, facing downwards, so that if a sweep of the net is made from below it invariably escapes.

348. *Drina donina*, Hew.

Rather a common butterfly of which a number of both sexes were taken on Kalataung, 1,500′, and a female at Pagaye and Kambauk, during December and January. It keeps to low trees and bushes and flies little, even when disturbed. I found females more plentiful than males.

349. *Charana mandarinus*, Hew.

About twelve males and three females were caught on the top of Pagaye hill, 600′, during December and January 1919-20. This butterfly seldom approaches to within reach of an ordinary net and to secure most of the specimens I have, my catcher had to climb a tree to about 25 feet from the ground.

350. *Lahera eryx*, L.

A single male taken at Nabule on 11th August 1914.

351. *Catapœcilma elegans*, Druce.
Many specimens of both sexes taken at Pagaye, Wagon, Kambauk, Sabataung and Maungmagon. It appears to prefer low elevations and heavy jungle.
352. *Horaga moulmeina*, Moore.
Numerous males and few females taken at Pagaye, Sabataung, and Kalataung during December and January. It is most plentiful on Pagaye hill during December.
353. *Liphyra brassolis*, Wd.
A single female taken in a garden in the town of Tavoy on 10th May 1917. This specimen was hovering around a nest of the large red ants and was at first taken for a day moth.

Family—HESPERIIDÆ.

Subfamily—HESPERIINÆ.

354. *Orthopœtus lalita*, Doh.
A pair taken at Yeawing in February 1919. It appears to be a rare species and was not met with in any other place.
355. *Celænorrhinus aurivittata*, Moore.
A pair taken on Sinbo-Sinma, 300′, in October 1918, and a female at Pagaye, 600′, in December 1919.
356. *Coledenia dan*, Fab.
Very common throughout the district.
357. *Odontoptilum angulata*, Felder.
Not common; a few specimens taken at Pagaye and Wagon during December 1919.
358. *Odontoptilum pygela*, Hew.
Two males taken at Pagaye, 200′, in January 1920.
359. *Tagiades helferi ravi*, Moore.
Very common throughout the district on the flowers of a species of *Ageratum*, locally called "Visa".
360. *Tagiades gana*, Moore.
A single male taken at Pagaye, 200′, on 30th December 1919.
361. *Tagiades lavata*, Butler.
Two males taken at Pagaye, 200′, on 6th January 1920.
362. *Tagiades atticus*, Fab.
Very common, especially during December and January, throughout the district.
363. *Tagiades dealbata*, Dist.
Two males taken at Pagaye, 200′, on 13th December 1919.
364. *Tagiades trichoneura*, Felder.
A few specimens taken on the hills at Pagaye, Wagon and Kalantaung, between August and June.
365. *Tagiades pralaya*, Moore.
Several of both sexes taken in company with the above and from which they appear to differ but little.
366. *Satarupa bhagava*, Moore.
Taken sparingly at Pagaye and in the Kaleinaung Forest Reserve during December and January.
367. *Odina decoratus*, Hew.*
Eleven males and two females were caught on the top of Pagaye hill, 600′, during December and January 1919-20. They generally put in an appearance, at one particular spot on this hill top at about 4 p.m., but were never numerous, the most I saw in a day being three. They are most restless creatures and fly almost continuously for an hour or so and then disappear.

Occasionally they settle on the underside of a leaf and give one a chance, but to take them on the wing is almost impossible owing to their extremely rapid flight.

368. *Odina ortygia*, DeN.

A single male taken on the top of Pagaye hill, 600′, in company with *Odina decoratus*, Hew, on 5th January 1920. This species has the same habits as *O. decoratus*, flies extremely fast and suddenly settles on the underside of a leaf with wings outspread.

Subfamily—Pamphilinæ.

369. *Sancus pulligo*, Mab.

Extremely common everywhere at all seasons.

370. *Koruthaialos xanites*, But.

A common species found throughout the district. It keeps to damp and shady ravines in dense forest.

371. *Koruthaialos rubecola*, Plötz.

Not near so plentiful as *K. xanites*, but flies in company with it. Maungmagan and Kambauk are the best places for this species.

372. *Suada swerga*, DeN.

Fairly common at Pagaye and along the Pachaung-Kambauk road. It comes to the flowers of the "Visa".

373. *Iambrix salsala*, Moore.

Common at the foot of the hills all over the district.

374. *Scobura cephala*, Hew.

Several specimens of both sexes taken at Pagaye and along the Pachaung-Kambauk road during December and January.

365. *Erionota thrax*, L.

Very common at the foot of the hills and on the plains throughout the district.

376. *Erionota batara*, Moore.

Appears to be rather a rare species as I only secured three males and two females. A pair were taken on Sabataung, 200′, on 3rd December, and a pair at Maungmagan on 28th December 1919, and a male at Pagaye, 200′ on 17th May 1916.

377. *Gangara thyrsis*, Fab.

Rather uncommon; a few specimens of both sexes taken during December and January.

378. *Matapa aria*, Moore.

A few of both sexes taken on Sabataung, 500′, and at Pagaye, 200′, in December.

379. *Kerana diocles*, Moore.

Common all through the district and at all seasons.

380. *Stimula, swinhoei*, El. and Ed.

A single male taken at Yeawing in February 1918.

381. *Plastingia callineura*, Felder.

Two males taken at Pagaye, 300′, during January 1920 and a pair in October 1919.

383. *Plastingia corissa*, Hew.

A pair taken on the Pachaung-Kambauk road on 10th January 1920.

383. *Plastirgia naga*, DeN.

Several males and two females were taken on Pagaye hill, 600′, from December to January 1919-20. These were all caught in one spot, in deep shade.

384. *Lotongus calathus*, Hew.

A single male taken on Pagaye hill, 200′, on 17th January 1920.

385. *Pithauria marsena*.

A few males taken at Pagaye and along the Pachaung-Kambauk road in January 1920.

386. *Notocrypta feisthamelii*, Bdl.
Extremely common at all elevations.
387. *Udaspes folus*, Cramer.
Fairly plentiful at Pagaye and Wagon in June.
388. *Cupitha purrea*, Moore.
Taken sparingly ; a male at Maungmagan and one at Kambauk in January and a few of both sexes at Pagaye during December.
389. *Telicota bambusæ*, Moore.
Extremely common all over the district and at all elevations.
390. *Telicota gola*, Moore.
Very common at all seasons.
391. *Telicota dara*, Koll.
Very common throughout the district.
392. *Pirdana hyela rudolphii*, El. and DeN.
Taken sparingly at Pagaye and along the Pachaung-Kambauk road, during December and January.
393. *Halpe zema*, Hew.
Common everywhere. I found it very plentiful along the Pachaung-Kambauk road during January 1920.
394. *Halpe sikkima*, Moore.
Many of both sexes taken along the Pachaung-Kambauk road, during January, on the flowers of the *Ageratum* (Visa).
395. *Halpe masoni*, Moore.
Taken very sparingly at Pagaye in December and at Kambauk during January 1920.
396. *Iton semamora*, Moore.
Fairly common at low elevations, along roads and streams.
397. *Parnara oceia*, Hew.
Several of both sexes taken at Pagaye during December 1919 and on the Pachaung-Kambauk road in January 1920.
398. *Badamia exclamationis*, Fab.
Extremely common throughout the district but appears to keep to low elevations.
399. *Ismena gomata*, Moore.
A single female taken on Pagaye hill, 300′, on 16th December 1919.
400. *Hasora chuza*, Hew.
A rare species of which only four males and one female were secured. Two males on Kalataung, 1,700′, in November, one at Pagaye, 400′, in April and one in May and a female at Myekhanbow in April.
401. *Hasora chabrona*, Pl.
Not common, a few taken at Pagaye and Maungmagan during December 1919. At Maungmagan I found this species on some prickly bushes on the beach.

A NOTE ON THE NIDIFICATION AND HABITS OF SOME BIRDS IN BRITISH GARHWAL.

BY

A. E. Osmaston.

(*With three plates and a map*)

This note is the result of about ten years' residence in the district of Garhwal lasting from 1910 to 1920. My work as Forest Officer necessitated much touring throughout this portion of the hills and often led me for weeks together into more or less remote places where I had ample opportunities for observing the very interesting and varied bird life of these forests. My remarks are only intended to cover the hilly portion of the district and do not include the plains portion lying to the south. Actually my observations did not even extend to the line of the plains and were almost entirely confined to the hills lying north of a line drawn south-east and north-west through Lansdowne.

British Garhwal occupies a strip of the Himalaya running from the plains right up to the borders of Tibet. The rivers drain directly into the Ganges, which itself forms the western boundary of the district for a distance of some 80 miles. Thence onwards to its source this fine river with all its tributaries, excepting only the upper reaches of the Pindar, lie entirely within the district. To the east of Garhwal are the hills of the Almora and Nani Tal districts, and to the west lie the hills of the Tehri Garhwal State.

The rainfall varies considerably according to the local configuration, but it is possible to differentiate three tracts as follows:—Firstly a wet tract comprising all the hills south of Joshimath (and this includes about $\frac{3}{4}$ of the whole area to which this note applies) where the average annual precipitation varies roughly between 50 and 80 inches. Secondly the area north of Joshimath excepting that portion of the Dhauli Ganga above its junction with the Rishi Ganga. Here the average annual precipitation probably varies between 20 and 40 inches. And thirdly the remaining area up the Dhauli valley as far as the borders of Tibet where the average annual precipitation probably does not exceed 10 to 20 inches.

There are in all some 2,000 square miles of forest which often forms uninterrupted blocks of large extent. In the central hill ranges, however, practically all the available land below 8,000′ elevation has been brought under cultivation, though even here there are always many slopes too steep for cultivation where forest, often of a secondary type, intersects the broad expanses of terraced fields.

In a normal year snow does not fall below 5,000′ in winter, and it never lies for many days together at elevations below 7,000′. By the beginning of June there is seldom much snow left below 12,000′ and from this time on through the months of July, August and September the beautiful alpine pasture lands offer a welcome to those birds which retire each year to rear their families in the peaceful seclusion of these lofty mountains.

The uppermost limit at which forest will grow in the wet tract is about 11,000′, but in the dry interior tract it reaches an elevation of 12,000′ to 13,000′.

In the notes which follow the numbers in brackets which will be found after each scientific name refer to the numbers given in the Fauna of British India.

Corvus corax (1).—The Raven.

The Raven is, I believe, only found in Garhwal within a narrow belt of country about ten miles wide lying along the Tibetan border eastwards from the Niti pass. This tract lies entirely above 13,000′ elevation and consists of treeless barren slopes. During two visits to these parts I only saw two or three pairs and the species is certainly far from common.

Urocissa flavirostris (13).—The Yellow-billed Blue Magpie.

Tolerably common in forests of the central and interior ranges from about 6,000′ to 9,000′ elevation. I took a clutch of four fresh eggs in May from a nest

BIRDS OF BRITISH GARHWAL.

which was placed 8′ from the ground in a shrub of *Rhododendron arboreum*. The nest was a deep saucer of matted rootlets with a few twigs on the outside. Though the range of this magpie slightly overlaps that of its equally common relative *U. occipitalis* I have never seen the two associate together.

Nucifraga hemispila (27).—The Himalayan Nutcracker.

This bird is found all over the central and interior hill ranges wherever forest of coniferous species occurs, though I have not noted its occurrence south of the Dudatoli and Dhanpur ranges. This however is what one would naturally expect since the only conifer found here is the chir (*Pinus longifolia*) and though the nutcracker frequently descends to 6,000′ elevation to feed on the chir seed it would not appear to be a permanent resident at this level except in some of the cooler valleys of the interior ranges. The bird is usually found between 6,000′ and 10,000′, and in many of the coniferous forests, especially those composed of spruce and blue pine, it is very common at these elevations. It frequently utters a raucous "Kurr", which is the only note I have ever heard. There is apparently a mistake in Blanford's Fauna where the nasal bristles are described as chocolate brown. The nasal bristles of this bird are in reality black-and-white and are quite similar to those of *N. multipunctata*. The latter is found according to Blanford as far east as Kumaon and should therefore occur in Garhwal, but though I have taken some pains to discover its identity in Garhwal I did not succeed in doing so.

Graculus eremita (29).—The Red-billed Chough.

This bird, like the yellow-billed chough, does not extend its range south of the slopes immediately surrounding the main line of snows. Like its cousin it is a bird of the open steep pasture-lands and rocky slopes which lie above and beyond the limits of tree forest, though it also frequents similar open ground at elevations down to 6,000′. The two species are about equally common. The natives call the bird "Kangni" and though it is not by any means shy it is not often seen round habitations or cultivation. It breeds in clefts in vertical or overhanging cliffs from 6,500′ up to 14,000′ elevation. The lowest place at which I found it breeding was in a vertical cliff overhanging the Dhauli River a few miles below Surai Tota, but all the nests I located were so inaccessible that I was unable to reach them. On 1st June some nests had young, so they probably commence laying towards the end of April or early in May. I never found more than one pair breeding in the same locality. A carcase of a burhal which, as I have mentioned elsewhere, was largely patronised by the yellow-billed species, did not to my knowledge attract any of the red-billed species though they were not uncommon in the immediate neighbourhood. The old birds have a call closely resembling that of the common jackdaw. By the end of July the young birds have left the nest and at this time they congregate in large flocks, mainly I think at high levels. At about 13,000′ elevation in August, I counted as many as 100 birds in a single flock. I have never observed this species circling about in the air in pursuit of insects in the manner so characteristic of the yellow-billed species.

Pyrrhocorax alpinus (30).—The Yellow-billed Chough.

In Garhwal this bird does not seem to wander south from the slopes which directly diverge from the main axis of snowy peaks. Open rocky or grassy slopes are its favourite haunts and it is never seen in forest. It also seems to shun cultivation and this no doubt accounts for its absence from the high central ranges which are either densely wooded or under cultivation. Their food seems to be of a varied nature. I have seen a flock of them in July feeding on the ripe fruit of *Berberis lycium* and on another occasion I took from their gizzards the stones of some wild fruit. I have also watched numbers of them come and feed on the carcase of a burhal which had been killed by a snow leopard. They may often be seen hawking about in the air for insects in parties of 20 or 30 and whe

thus engaged they float about in graceful circles on almost motionless wings until attracted by the sight of some insect they suddenly dive headlong with rapid twists and turns in deft pursuit of the quarry. They may also be observed busily quartering the ground for insects, and should an insect be disturbed and take to flight on the approach of one of the birds, the chough will immediately take to its wings to continue the pursuit in the air. They may sometimes be seen sitting on the backs of barhal just as starlings sit on the backs of sheep in England. During the winter months they are commonly found as low as 6,000′ elevation, but as the snow disappears they seem to prefer higher elevations and in July I did not find any birds below Juma in the Niti Valley which is at about 8,000′ elevation. Moreover as early as the beginning of June I found them common up to 15,000′ elevation. The note of these birds closely resembles to my mind that of the common bank-myna of the plains.

Ægithaliscus erythrocephalus (35).—The Red-headed Tit.

This bird is widely distributed throughout the hills and may be classed as one of the common species though I have never seen them in large numbers together. Four nests which I found on different occasions were situated at elevations between 6,500′ and 8,000′, and eggs were laid during April or the first half of May. They were situated at varying heights from a few inches up to 10′ above the ground and were well concealed. The oval nest was in every case, of fine moss lightly held together or intermingled with either spider's web (especially the cocoons) or vegetable down, and this was followed by a little bark, fibre, grass or hair. The interior was copiously lined with feathers. I notice that Blanford does not mention the feathers, but mentions roots instead, which I have never found.

Ægithaliscus niveigularis (38).—The White-throated Tit.

The only place where I have seen this apparently rather rare bird is in the forests of the Dhauli valley in Painkhanda Malla. Here in a mixed forest of birch (*Betula utilis*) and silver fir (*Abies pindrow*) I came across two old birds, feeding a flock of young ones. This was at 11,000′ elevation on 24th June. In my notes on one of the old birds which I shot I recorded that the bill was black and the feet pale yellowish brown.

Garrulax albigularis (76).—The White-throated Laughing Thrush.

These birds are found practically throughout the hills at all elevations up to 10,000′, and are fairly common wherever there is forest. I have taken eggs at 7,500′ in April and again at 9,500′ in May. These two nests were placed from 5 to 10′ above the ground in the midst of oak forest. On the three occasions when I have taken the eggs of this bird I have always been more or less surrounded by quite a number of individuals of the same species who invariably showed their disapproval of my presence by loud and vehement hissing. From this, one might reasonably expect to find several pairs breeding in close proximity, and possibly they do so, though I have never found more than one nest in the same immediate neighbourhood. One of the nests I found was composed of thin fibrous material and lined with a substantial layer of roots and rhizomorphs; the other was constructed of masses of rhizomorphs mixed with feathery grey lichen and followed by a layer of dead ringal leaves with a thick lining of fine roots and rhizomorphs.

Trochalopterum variegatum (90).—The Eastern Variegated Laughing Thrush.

This is the common laughing thrush of the high level forests, namely those situated above about 8,000′ elevation. The only two nests I found contained eggs during the second week of June. They were placed in bushes from 3′ to 5′ above the ground, and both were constructed of very similar material. On the outside there was dry grass and fibre, and this was followed by a thick layer of papery bark which in one case had been taken from the "burans" (*Rhododendron arboreum*) and in the other from the "bhuj" (*Betula utilis*). In both cases there was a lining of fine roots.

Grammatoptila striata (101).—The Striated Laughing-Thrush.

Well distributed all over the hills wherever suitable dense forest occurs. Blanford gives its range as 6,000′ to 9,000′, but in Garhwal it is found down to 4,000′ along densely wooded moist ravines of the outer hills.

Proparus vinipectus (183).—The Plain-brown Tit-Babbler.

On the 24th June I came across a nest of this bird at an elevation of 9,500′ in the Dhanpur range of hills in central Garhwal. The nest was suspended among the fine pendant branchlets of a ringal culm (*Arundinaria spathiflora*) at a height of about 4′ from the ground. It was situated in the middle of a fairly dense forest of brushwood and ringal. The nest was a deep cup composed outside of green moss and rhizomorphs, then a thin layer of *lonicera* fibre, birch bark, and dead ringal leaves, then a thick layer of rhizomorphs and rootlets, with a final lining of hair. The two eggs which the nest contained averaged ·68″×·53″ and were pale green heavily blotched round the larger end with pale sepia.

Hodgsonius phœnicuroides (199).—Hodgson's Short-wing.

This bird is very skulking in its habits which may partly account for the fact that I very seldom observed it ; yet I do not think that the bird can be common. Blanford writes of this bird " Bill dusky reddish at the gape," but I find my own notes on a female are " Bill black, lower mandible yellow at the base." I found it breeding in the middle of June up the Dhauli valley close to Dunagiri. Of the two nests I found, one at 10,000′ elevation contained two fresh eggs, the other at 11,500′ elevation contained three slightly incubated eggs. They were placed in low bushes in the vicinity of cultivation at a height of 1′ to 2′ above the ground. Both nests were deep cups and were similarly constructed. Outside there was bark fibre followed by grass with a lining of hair. The dark blue eggs averaged ·84″×·61″ for the clutch of two, and ·88″×·62″ for the clutch of three.

Oligura castaneicoronata (202).—The Chestnut-headed Short-wing.

In view of the limited distribution recorded by Blanford for this species its occurrence in Garhwal deserves mention, though I am aware that it has already been shot some years ago by my brother Mr. B. B. Osmaston, C.I.E., as far west as Jaunsar. I only obtained one specimen in Garhwal and this bird was shot close to Pauri at 6,000′ elevation in April. The skin was identified for me at the British Museum.

Siva strigula (219).—The Stripe-throated Siva.

This bird is found over practically the whole of the hill ranges of Garhwal at least as far north as Pipalkoti. In spite of its wide distribution it is not a bird that is very frequently seen. It has a rather plaintive whistling call of three notes uttered somewhat slowly and deliberately at equal intervals, the last note pitched lower than the other two. The flight is rather slow and laboured.

Yuhina gularis (223).—The Stripe-throated Yuhina.

Blanford has not recorded this species west of Nepal. I only shot the bird once and this was in a " banj" oak forest not very far from Rudrapryag at 7,500′ elevation. This bird, which was shot on 12th April, was one of a pair.

Sitta leucopsis (323).—The White-cheeked Nuthatch.

Blanford does not mention the occurrence of this species east of Mussooric. I however came across it in the dry interior blue pine (*Pinus excelsa*) forests of the Dhauli valley where I obtained specimens at 9,500′ elevation in June. I did not find the bird in any way common.

Dicrurus longicaudatus (328).—The Indian Ashy Drongo.

This is the common drongo of these hills and it breeds at all elevations up to 8,000′, and possibly higher. In the outer Himalayan valleys *Chaptia ænea* and other drongos are found and *D. ater* is also found locally in the outer hills, particularly in the more cultivated tracts, and occasionally at low elevations as far north as Nandpryag. But in central and upper Garhwal *D. longicaudatus* is the only common species. They leave the hills in the cold weather returning in

April and May for the nesting season, the eggs being usually laid in May. I noticed birds as far north as Tapoban beyond which they probably do not go. In the outer ranges they breed in the sal forest, but in the central hills they are most numerous in the forests of " banj " oak, whilst in the forests to the north they seem to prefer above all those mixed strips of deciduous forest in which horse-chestnut, elm, birch and similar species abound. The nest is usually placed from 10 to 20 feet above the ground wedged in a half-suspended position into the fork of a bough. The material of which the nest is constructed is invariably strengthened and more or less covered on the exterior (but especially the rim) with cobweb which is also used to bind the nest to its support. The nest is a lightly-built deep saucer composed outside of herbaceous stems and grasses, and for this part of the work the birds exercise considerable skill in selecting material which has a natural stickiness and is of suitable shape to conform to the curves of the nest. Thus where the tree *Phyllanthus emblica* is found these birds, like many others, use the curved leafless and discarded deciduous shoots which easily attach themselves by means of the numerous slightly raised leaf-bases on either side of the twig. Similarly in the forests beyond the region of *Phyllanthus emblica* these birds commonly use the dry fruiting spikes of *Desmodium concinnum* which not only possess a natural curvature suitable to the nest, but are also somewhat sticky owing to their hairiness. The interior of the nest is lined with fine grass stems or the heads of grasses or occasionally fine black rhizomorphs. Like most drongos they are extremely bold and the parents frequently make angry sallies at any person who approaches close to the nest.

Anorthura neglecta (352).—The Kashmir Wren.

Blanford says " I have seen no specimens of wrens collected between Simla and the Nepal frontier and cannot say which of the two species occurs in that portion of the Himalayas." I wish now therefore to record the occurrence of the above species in the northern ranges of Garhwal.

Tribura thoracica (371).—The Spotted Bush-wren Warbler.

This bird is fairly common in suitable localities throughout the high ranges north of the Pindar river. As I had some doubts about the identification of the species, I sent two skins to the British Museum where they were kindly identified for me. In summer it frequents open grassy places up to about 12,500′ elevation and is mainly found where the grass and other herbaceous growth is rankest. It is thus frequently seen round sites where sheep are temporarily quartered at this time of the year, and which are locally known as " kharaks ". Here the well manured soil often produces a vigorous growth of a species of dock. The bird has a most persistent " see see " note, and when uttering its song it usually rises a short distance above the ground dropping again out of sight into the grass and herbage. It may also occasionally be seen moving about amongst low shrubs.

Phylloscopus affinis (405).—Tickell's Willow-warbler.

Between the Chor-Hoti pass and the border of Tibet there lies a valley of gently undulating slopes occupying an area some 6 miles long by 2 broad, much of which lies between 12,000′ and 14,000′ elevation. This valley forms the head-waters of the Girthi river. The climate is Tibetan and the dry stony and sandy ground supports a scanty vegetation of dwarf loniceras, caragana, juniper and willow. It was in this valley that I found *P. affinis* breeding at 13,500′ elevation in considerable numbers, though I noticed no other member of the warbler family here. Two birds which I shot were identified for me at the British Museum, and I will give my own note on the freshly killed birds as it differs in some respects from Blanford's description. " Legs, feet and claws pale yellowish brown, the feet darker above but yellowish beneath. Irides dark brown. Upper mandible blackish turning yellowish brown at the gape, lower mandible yellowish brown." The bird has a "tack-tack" note similar to that of

many other warblers. It also possesses a song, if such it may be called, composed of a single note uttered some 4 to 6 times in rapid succession and preceded by a single rather higher pitched note. In the first week of August nesting is almost complete and at this time I could only find one nest with half-fledged young, two from which the young had already flown, and one deserted nest with eggs. These eggs were pure white and the average measurement of three of them was ·6″ × ·45″. The nests were all placed from 6″ to 1′ above the ground in low dense willow bushes which were growing in a gregarious manner on a piece of level ground bordering the stream. They were almost round in shape with a side entrance and were constructed of rough dry grass and lined with feathers.

Phylloscopus pulcher (414).—The Orange-barred Willow-warbler.

This species breeds in considerable numbers in the birch (*Betula utilis*) forests of the interior, and is abundant during the breeding season in forest of this species at elevations between 11,000′ and 12,000′ situated in the Dhauli valley. They seem to be entirely arboreal in their habits and do not frequent bushes. Their note during the breeding season is very characteristic and when once learnt readily serves to distinguish them from their many relations of somewhat similar appearance. The song is composed of rapidly vibrated notes forming a high pitched trill in a slightly descending cadence and is a very perfect imitation of a similar trill uttered by the wood-wren in England. The only nest I succeeded in finding was placed against the trunk of a birch where it had been securely wedged between the trunk itself and some loosely attached pieces of the bark. The tree was in the middle of fairly dense birch forest, and the nest was placed about 10′ from the ground. It was domed and composed externally of a few strips of birch bark, a little moss, and grass, and lined with monal feathers. It contained three hard set eggs which were white with pale reddish brown spots mostly centered round the larger end. Two of the eggs were so damaged in the process of blowing that they could not be accurately measured, but the third egg measured ·58″ × ·42″.

Phylloscopus proregulus (415).—Pallas's Willow-warbler.

I found two nests of this bird in forests up the Dhauli valley. One nest contained 3 fresh eggs on 12th June and was placed about 10′ above the ground on a horizontal deodar bough in open deodar forest at 9,500′ elevation. The other nest contained 2 fresh eggs on 25th June and was placed about 10′ above the ground near the top of a young silver fir in a fairly dense mixed silver fir and birch forest at 11,000′ elevation. Both nests were domed, and whilst one was composed of grass and blue pine needles with a little hair, the other was composed of moss and grass with a few strips of birch bark. Both were copiously lined inside with feathers.

Acanthopneuste lugubris (426).—The Dull-green Willow-warbler.

It appears that Blanford had no definite record of the occurrence of this species anywhere west of Sikhim, but I found it not uncommon during the breeding season in the birch (*Betula utilis*) forests of the Dhauli valley from 11,500′ to 12,500′ elevation. Two of the specimens I obtained were identified for me at the British Museum and there can therefore be no doubt about the identification being correct. During the breeding season the bird utters a loud sparrow-like chirp repeated once or several times together. On 26th June I found a nest with two fresh eggs. It was placed in a crevice in the side of an old birch tree about 6′ from the ground, the tree being so situated that birch forest extended in one direction and open grassy slopes in the other. The nest was domed and was composed outside of moss with a little lichen. This was followed by a mixture of grass lichen and moss, and there was a final lining of fine moss mixed with just a few hairs and one or two small feathers. The eggs which were pure white average ·62″ × ·46″.

Cryptolopha burkii (433).—The Black-browed Flycatcher-warbler.

This is not a common species in Garhwal and its distribution seems to be rather local. During the breeding season it is found in some of the inner densely forested valleys, the Birai Ganga valley being to my knowledge a regular resort of these birds though seldom met with elsewhere. The cock bird has a really fine song of loud clear notes, and it sometimes utters a trill resembling that of a trained canary. On several occasions I have been filled with admiration for the song which might easily be attributed to a much larger bird, and the notes loose none of their enchantment when uttered from the depths of some shady forest such as these birds frequent. On 24th June I found a nest near Lata village in the Dhauli valley at 9,500′ elevation. It was placed on the ground and domed, being constructed entirely of strips of bark fibre and a little coarse grass, whilst inside there was a thick pad of fine moss. There were four pure white eggs which were on the point of hatching and which measured on the average ·65″ × ·5″.

Horornis brunnescens (447).—Hume's Bush-warbler.

The distribution of this interesting little bird is given by Blanford as Sikhim and probably also Nepal. It however occurs in Garhwal though it is local in its distribution and probably rather rare. A skin obtained by me in March at 4,500′ elevation was kindly identified for me by the British Museum. From April onwards I have observed it between 8,000′ and 9,000′ elevation where it frequents dense forest of ringal (usually *Arundinaria jaunsarensis*) either pure or mixed with a more or less open forest of karshu (*Quercus semecarpifolia*). The song of this bird is most peculiar and striking, and consists of three very shrill notes uttered in an ascending scale and pitched so as to give one the impression of being out of tune. They are uttered slowly and with great deliberation and are followed by a double note, something like "chee chew," repeated two or three times. The bird is a great skulker and extremely difficult to detect amongst the thick ringal undergrowth which seems to form its usual habitat during the breeding season.

Horornis pallidus (450).—The Pale Bush-warbler.

Blanford gives the distribution of this bird as extending east to the Bhagirathi valley in the Tehri Garhwal State, but it is quite fairly common in the central and interior hill ranges of British Garhwal. In summer it is found at about 8,000′ elevation frequenting dense scrubby secondary forest of the type usually found in the vicinity of villages where the trees and shrubs are continually lopped or periodically cleared. It has a very peculiar loud song consisting of two distinct parts. These two parts are generally uttered alternately at an interval of a minute or less. One part consists of 3 or occasionally 4 notes, the other of 5 notes. In each case special stress is laid on the first note which is drawn out to a considerable length in contrast to the notes which follow. When singing, it occasionally mounts to a commanding position above the surrounding scrub; though it more frequently remains, as at other times, well hidden. It is not however a shy bird. A skin of this species was kindly identified for me by the British Museum.

Horeites brunneifrons (455).—The Rufous-capped Bush-warbler.

During the month of May I found this species not uncommon in open banj (*Quercus incana*) forest near Pauri. Its habits were those of a confirmed skulker and it largely frequented some low bushy undergrowth composed of *Myrsine africana* and other small shrubs. It was observed creeping about on the ground in and out of crevices, and even when forced to break cover it seldom rose more than a foot or two. Its note is an abrupt "pick pick", but as it was probably not breeding in these low hills it may have quite a different breeding song. A skin obtained at Pauri was identified for me at the British Museum.

Waterfalls in the Rup Ganga surrounded by forest. The fall photographed is 180 feet high.

The Northern Slopes of Chaukhamba.

Suya crinigera (458).—The Brown Hill-warbler.

This is a common bird throughout the hill ranges of Garhwal and is found up to at least 7,000′ elevation. It occurs in all forms of open forest, secondary scrub, and along banks and hedges bordering cultivated fields. The breeding season seems to commence about the beginning of June and at this time the cock spends much of his time perched on the top of a bush, preferably some 10′ to 15′ from the ground, whence he continually utters his rather monotonous " tsee tswee-tsee tswee etc." From time to time he performs rather curious aerial evolutions consisting of a series of short headlong dives which are moreover accompanied by a loud flutter, though how exactly this noise is produced I could not discover. The nest is placed a few inches above the ground attached (in the few cases I observed) to young growing grass stems. Blanford describes it as a deep cup, but those I saw were egg shaped with a side entrance near the top It is constructed of fine dry grass stems and lined with vegetable down.

Lanius vittatus (473).—The Bay-backed Shrike.

Found all over the outer and central ranges at least as far north as the Pindar valley where I have observed it up to 6,000′ elevation.

Campophaga melanoschista (505).—The Dark-grey Cuckoo Shrike.

This bird is well distributed all over the low outer ranges during the breeding season, and appears to rather prefer the cultivated tracts to continuous forest areas. On the 20th May 1912 I succeeded in finding a nest with well incubated eggs at an elevation of 3,500′. The nest, which was placed in a fork of a pine bough about 10′ above the ground, was a flimsy structure with only a shallow depression in the centre. It was composed almost entirely of the dead deciduous shoots of *Phyllanthus emblica* woven together with spider's web and well decorated all round the rim with lichen. This nest was one of several built apparently under the protection afforded by the proximity of a drongo's nest. This drongo, *D. longicaudatus*, had a nest in another chir tree and in this tree there was also a nest of *Molpastes leucogenys* placed only 3 or 4 feet above the drongo's nest. The former contained young a few days old. The cuckoo-shrike's nest was not fifteen paces away, and in the same tree with the cuckoo-shrike's nest there was a nest of *Oriolus kundoo* just ready for eggs. But this was not all ; within a similar radius of 15 paces from the drongo's tree a green pigeon had its nest in a pollard *Terminalia chebula* and a rose starling was nesting in a hole in an *Engelhardtia* tree. Thus five pairs representing five distinct species had availed themselves of the protection afforded by the drongos. The cuckoo-shrike has a dipping flight similar to that of an oriole.

Oriolus traillii (522).—The Maroon Oriole.

I have only observed this beautiful oriole on three occasions, once at Kanol and twice in the Malla Kaliphat patti, and Blanford I think is correct when he mentions that the distribution of this species is local. I found it during the months of April and May in forest composed of banj (*Quercus incana*) and Moru (*Quercus dilatata*) and also in mixed deciduous forest containing walnut, maple hornbeam, alder and horse-chestnut at elevations between 5,000′ and 7,000′.

Hemichelidon sibirica (558).—The Sooty Flycatcher.

On the 12th June I found a nest containing two recently hatched young ones and one rotten egg. This was at 9,500′ elevation in an open deodar forest in the Dhauli valley. The bird was identified for me at the British Museum as *M. sibirica fuliginosa* which differs from the typical bird in having the first primary longer than the primary coverts and in possessing a shorter wing. The nest was placed about 8′ from the ground resting on the top of a horizontal deodar bough. It was composed of a little lichen, moss and grass woven together into a flimsy shallow cup and lined with a little hair. The egg which is very pale green faintly mottled all over with pinkish brown, measures ·63″ × ·44″.

Cyornis unicolor (574).—The Pale Blue Flycatcher.

This bird has not been recorded west of Sikhim and hence its occurrence in Garhwal is of some interest. I obtained a specimen in April at 5,500′ elevation in the Parson Gadh which is a side valley of the Pindar river, and the skin was afterwards kindly identified for me at the British Museum. This was the only occasion on which I came across this beautiful flycatcher and it is therefore probably rare in these parts. It was found frequenting rather dense forest.

Culicicapa ceylonensis (592).—The Grey-headed Flycatcher.

This bird leaves the hills during the winter months and returns about the end of February or beginning of March at which season its cheery little song is constantly heard in the lower valleys of the outer hill ranges. By the middle of May nesting operations are in full swing. Blanford says that the nest is built against a rock or tree, but the former must be very exceptional in Garhwal, where out of nearly a dozen nests which I have seen all have been placed against a tree trunk. I have found nests at all heights from 2 to 40 feet above the ground. Trunks of oak trees seem to be special favourites, probably on account of their convenient rough bark. The nest is a deep cup composed entirely of fine green mosses which are lightly woven together on the outside with spider's web. The rim of the cup is prolonged some two or three inches on each side in a vertical direction up the tree trunk thus giving considerable support to the nest, and occasionally these prolongations actually meet above to form a sort of projection over the egg cavity.

Chelidorhynx hypoxanthum (603).—The Yellow-bellied Flycatcher.

This graceful little bird may be seen during the cold weather months along the main valleys where the elevation is only 1,000′ to 3,000′. It breeds however at high altitudes, and on 29th June I found a nest with 3 fresh eggs in the middle of a large forest at 11,500′ elevation. It was placed about 15′ from the ground at a distance of a few feet from the main stem on the horizontal branch of a fair-sized silver fir tree. The nest was a deep cup with rather thick walls, the external diameter being about 3″ whilst the cavity only measured 1″ diameter and $1\frac{1}{4}$″ deep. It was composed of green moss thickly adorned with lichen which was attached by means of spider's web, and lined with moss fructifications. The eggs are a very pale pinkish white clouded in more or less of a ring round the larger end with pinkish brown and average ·57″ × ·43″.

Rhipidura albicollis (605).—The White-throated Fantail Flycatcher.

Found along streams and valleys all over the outer and central hills at least as far north as the Pindar valley where I found a nest on 25th April at 5,500′ elevation.

Saxicola œnanthe (624).—The Wheatear Chat.

On the 16th April I shot a female at about 6,000′ elevation in Ranigarh patti in central Garhwal, and the skin was identified for me at the British Museum as *S. œnanthe atrigularis*. This species was never seen on any other occasion.

Henicurus maculatus (630).—The Western Spotted Forktail.

Common, and found over all the lower, central, and some of the inner ranges. Blanford also includes Garhwal within the habitat of *H. immaculatus* but I never succeeded in identifying this species and if it occurs in Garhwal I think it must be rare or very locally distributed.

Ruticilla frontalis (639).—The Blue-fronted Redstart.

In August I found these birds not uncommon on the hillsides round Niti village frequenting bare stony ground, with large rocks scattered about, and grassy patches between—but no bushes. Amidst such surroundings they were observed from 11,500′ to 13,500′ elevation, and at the former altitude I found a nest on 20th August built inside a crevice in a stone wall and containing half-fledged young ones. During the cold weather months these birds are common all over the outer and central hill ranges between 4,000′ and 7,000′ elevation, often amongst cultivation.

Ruticilla rufiventris (644).—The Indian Redstart.

In August I found this to be a not uncommon bird in the country north of Niti bordering Tibet where it frequents the Bhutia camping grounds and becomes very tame. They appeared to have already completed breeding operations.

Tarsiger chrysæus (653).—The Golden Bush-robin.

Widely distributed, but not common. It certainly occurs up to 6,000′ elevation, if not higher.

Ianthia rufilata (654).—The Red-flanked Bush-robin.

This is a fairly common resident species in Garhwal. During the cold weather months it is most frequently seen from 5,000′ to 6,000′ elevation whilst in the summer season it ascends to much higher altitudes, and I have then shot it at 12,000′. The ultramarine eyebrow is mixed with a narrow streak of white feathers in all my specimens, and I am informed that white feathers are also present in most of the specimens at the British Museum, though the description in Blanford makes no mention of this. These birds frequent beds of streams, either dry or containing water, and they appear to prefer those bordered with dense bushes and shrubs, as they are of a retiring disposition and seldom expose themselves in the open for long. They have a habit of rapidly expanding and contracting the tail like a fan, but they do not move it vertically up and down.

Merula albicincta (672).—The White-collared Ouzel.

This fine ouzel is abundant all over the large forests of central and upper Garhwal above about 9,000′. When going to roost, and again at dawn, it utters a note closely resembling that made by the English blackbird under similar circumstances ; but the actual song, which is distinctly fine, is more like that of the English thrush. A nest which I found on 14th May contained 3 slightly incubated eggs. It was placed 5′ from the ground against the mossy stem of a karshu (*Quercus semecarpifolia*). The nest was constructed of masses of green moss and lined with a pad of fine dry grass mixed with a few rhizomorphs.

Merula castanea (673).—The Grey-headed Ouzel.

I have only seen this ouzel once. This was in Malla Nagpur on 31st January 1919 on the day following a very heavy fall of snow which on this occasion actually fell as low as 3,500′ elevation. The bird which I shot at 5,000′ elevation was, as far as I could discover, a solitary individual.

Merula boulboul (676).—The Grey-winged Ouzel.

This is a fairly common bird in some of the larger forests of central Garhwal, but it always keeps to dense forest and is also rather shy. Two nests found in May between 7,000′ and 8,000′ elevation were placed in trees at 7′ and 15′ from the ground respectively. The alarm note is a plaintive whistle usually repeated twice, but the cock has also a fine song of clear rich notes which are combined in most pleasing variations.

Geocichla wardi (683).—The Pied Ground-Thrush.

In these hills this bird is rather uncommon. On 15th June I found a nest with two eggs placed about 8′ from the ground in a small tree at 7,500′ elevation. The nest was constructed of green moss with a thick lining of roots. The eggs which are very pale greenish mottled all cover with pinkish brown and pale purple measure on the average 1·02″ × ·73″.

Petrophila cyanus (693).—The Western Blue Rock-Thrush.

This bird is never very common and appears to be rather local, frequenting steep rocky or boulder-strewn ground interspersed with grassy slopes. It occurs over the whole tract of hills even up to the borders of Tibet where I found it in August at 13,500′ elevation. The cock bird's song is a soft melodious rather short whistle which at times reminded me of an English blackbird. During the latter half of June I found three nests with eggs between 5,500′ and 6,500′ in the vicinity of Pauri. They were placed in cavities or crevices in the rocks so as to be partly screened from view, and the sites selected are sometimes situated on

such steep rocky ground that they can only be reached with difficulty. The nest is a shallow cup composed of dry grass and lined with fine roots. The eggs are a rather pale blue and most of them have a few speckles of pinkish brown, though one egg in each of two clutches of four is quite unspotted. In one of the clutches the surface is rather glossy, but not in the other two. The average measurements in two clutches of four eggs each are 1·04″ × ·76″ and 1·06″ × ·75″ and a single egg measures 1·01″ × ·77″.

Orecincla dauma (698).—The Small-billed Mountain-Thrush.

On several occasions I have met with this bird during the months of April and May at elevations between 8,500′ and 9,500′ in the forests of central and upper Garhwal. On each occasion I flushed the bird off the ground in fairly dense forest of karshu (*Quercus semecarpifolia*) or silver fir.

Oreocincla whiteheadi.

This mountain-thrush is described by Stuart Baker in Bull. B. O. C. XXXI, p. 79 (1913) and two skins which I sent to the British Museum were identified there as belonging to this species. One of these birds was shot on 27th April at 8,000′ elevation about 5 miles below Badrinath on open rocky ground with scattered bushes growing here and there. It was accompanied by 3 or 4 others of the same species. The other bird was shot on 20th June at 12,800′ elevation near Kulara camping ground in Dasoli where the surroundings for some considerable distance were open pasture land interspersed with rocky ground. This bird was an apparently solitary male. For this bird I noted "Inside mouth yellow. Legs yellowish."

Zoothera monticola (704).—The Large Brown Thrush.

I have seldom seen this bird and I think it must be a rather uncommon species in these hills. On 12th June I found a nest near Wan with fresh or nearly fresh eggs. It was placed about 15′ from the ground on the horizontal branch of a small walnut tree growing at the side of a large rocky stream with dense karshu (*Quercus semecarpifolia*) forest on all sides, the elevation being about 8,000′. The nest was a bulky structure and was composed of fresh damp green moss with a firm lining of roots, lichen and rhizomorphs. The eggs are a pale greenish mottled all over with reddish brown and very pale purple, and closely resemble a clutch I have of *Merula boulboul*. They average 1·26″ × ·86″.

Cinclus asiaticus (709).—The Brown Dipper.

A common bird over the whole of the hilly portion of Garhwal. When I have been at high elevations I have usually made a point of examining any dipper I came across to see if it were *C. kashmiriensis*, a bird which I expected to find, but for which I have searched in vain; so that if it occurs in these parts it must, I think, be either rare or very local.

Tharrhaleus strophiatus (718).—The Rufous-breasted Accentor.

In the Girthi valley bordering Tibet which I have briefly described in a note above on *Phylloscopus affinis* I also met with this accentor and it is possible that it does not occur elsewhere in Garhwal. During the first week of August I found three nests from one of which the birds had already flown. In one of the others there were 3 deserted eggs, and in the third nest there was one single hard set egg; probably a second nest. The nests were placed from 12″ to 18″ above the ground in low, rather dense, willow scrub (*Salix sclerophylla*). They were rather deep substantially built cups. On the outside were a few twigs or coarse herbaceous stems, and this was followed by masses of green moss mixed with wool and hair (of the Marmot). Moss fructifications were conspicuous throughout the structure and especially in the interior, but I doubt if they are collected separately from the moss itself. All these nests were at 13,500′ elevation. The clutch of 3 eggs gave an average measurement of ·81″ × ·57″ and the single egg measured .75″ × .55″. The only note I heard these birds utter was a rather high pitched "tr-r-r" somewhat resembling the noise produced by striking two stones together.

Pycnorhamphus affinis (742).—The Allied Grosbeak.

Blanford gives the distribution of this species as Nepal and Sikhim, whilst he includes Garhwal within the distribution of *P. icteroides*. I found *P. affinis* widely distributed all over central and upper Garhwal and locally quite common in some of the larger forests of this tract such as Dudatoli and Dasoli, whilst I never succeeded in procuring a single specimen of *P. icteroides*. If Blanford based his "Garhwal" on specimens collected in Tehri Garhwal, then I think *P. icteroides* is probably not found at all in British Garhwal. I have seen *P. affinis* at all elevations from 6,000′ up to 11,500′. They usually frequent forest containing a certain percentage of one of the conifers, namely, spruce, silver fir, blue pine, or chir, though I have also come across them in almost pure karshu (*Quercus semecarpifolia*) forest. They probably feed mainly on coniferous seed though I have watched them eating the kernels of the unripe fruit of *Machilus Duthiei*, and on one occasion I extracted two hairless caterpillars from the gizzard of a specimen I had shot. The alarm call is a double note somewhat resembling the striking together of two stones, and might be written "kurr". They have also a fine loud musical whistle of either 5 or 7 notes. When the full 7 notes are uttered, the first six fall into two series of 3 ascending notes each, the seventh note being pitched much lower. When only 5 notes are uttered the second and third are omitted. The call might be written "Ti-di-li-ti-di-li-um", emphasis being placed on the first and fourth syllables. From what I have seen they appear to commence building the end of May or beginning of June.

Mycerobas melanoxanthus (744).—The Spotted-winged Grosbeak.

I have only met with this bird on three occasions, and all three places where it was seen were in upper Garhwal. On two of the three occasions I came on a flock of these birds feeding on the fruit of "kaphal" (*Myrica Nagi*) the stones of which are cracked and the kernel extracted. As the stone of this fruit is extremely hard the bird's bill must be very powerful indeed.

Propasser pulcherrimus (755).—The Beautiful Rose-Finch.

This is another species which I found breeding in the Girthi valley bordering Tibet. It was not nearly so common as *Carpodacus erythrinus*, but there were quite a fair number of birds about, and I managed to find three nests with eggs between the 3rd and 8th of August. The nests were at 13,000′ to 13,500′ elevation and were placed 6″ to 18″ above the ground in bushes of *Juniperus pseudosabinus*. They were fairly deep cups composed outside of the fibrous bark of juniper and *Lonicera* with or without a little grass; this was followed by a layer of fine roots mixed with a little sheeps' wool, and there was a final lining of hair mixed in one case with red moss fructifications. All the nests contained full clutches of 3 eggs each the average measurements for the three clutches being 75″ × ·55″ × ·75″ — ·55″ and ·76″ × ·54″. All the eggs are greenish blue sparingly spotted or streaked with black round the larger end.

Blanford's description of this bird contains the following: "Iris reddish brown; bill horny brown with the lower mandible greyish; legs rosy grey" but my notes on these parts being somewhat dissimilar are perhaps worth recording; they are "Iris nut brown. Legs and feet pale fleshy brown, claws darker brown. Bill dark horny brown, the lower mandible much paler."

When the parent birds are flushed off the nest they do not utter the canary-like note so distinctive of *Carpodacus erythrinus*, but they have instead a rather sparrow like "Cheet-cheet", and whenever they are excited they also raise a distinct crest of feathers.

Carpodacus erythrinus (761).—The Common Rose-Finch.

In the part of the Girthi valley which I have already described I found these rose-finches breeding in considerable numbers and I took altogether nine clutches of eggs here during the first ten days of August. They were all at 13,000′ to 13,500′ elevation and were placed from 6″ to 4′ above the ground in dense low bushes of willow (*Salix sclerophylla* and *Salix Wallichiana*) growing along the

banks of streams. The nest is a deepish cup of herbaceous stems and dry coarse grass, followed by a layer of fine roots or grass, with a lining of hair or fine roots or both. In one case a little wool had been introduced. Six of the clutches which were complete contained four eggs each and one only contained three eggs. The eggs in the six complete clutches measured on the average:—·81″×·57″, ·84″× ·56″, ·81″×·60″, ·82″×·58″, 83″×·60″ and ·80″× ·56″. They are pale greenish blue lightly spotted round the larger end with dark sepia and pale brown madder. Three out of 4 eggs in one clutch are unspotted. When driven off her nest the hen bird almost invariably utters a canary-like wining "twee-ee." The cock bird's song is composed of three loud shrill notes which may be written "Ter-twee-you," the middle note being pitched higher than the other two. This is also sometimes varied by the addition of a few more notes. But the cock has also another quite different and distinct song composed of 4 high-pitched notes which may be rendered "Tee-diew-di-diew."

Carduelis caniceps (767).—The Himalayan Goldfinch.

During the months of June and July I found these finches not uncommon along the Dhauli valley from Joshimath right up to the borders of Tibet. The highest elevation at which I observed them was 13,500′. I could not discover where they were breeding, though from the enlarged testes of a male shot on 20th June I think this would be the nesting season. I have never met with these birds south of Joshimath though it seems probable that in winter they move down further south.

Metoponia pusilla (771).—The Gold-fronted Finch.

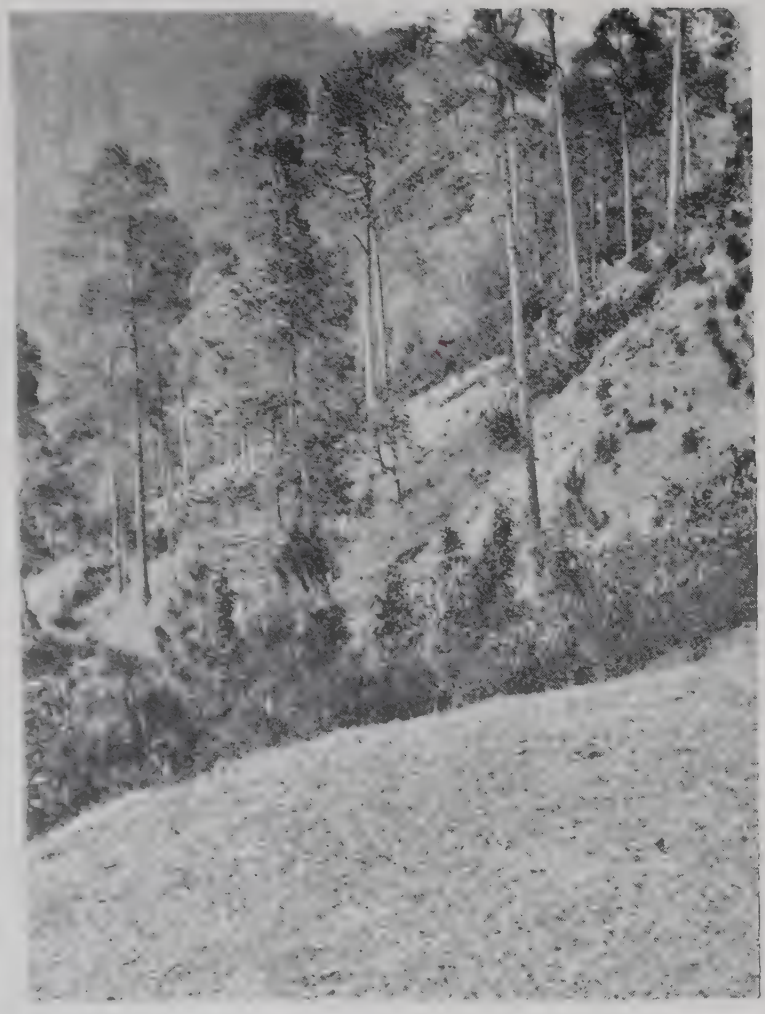
On 20th July I found a nest containing a clutch of 5 eggs at about 11,500′ elevation close to Niti village. The nest was placed about 4′ from the ground in a *Rosa sericea* bush. It was a deep cup composed of dead grass and bark fibre and lined with a thick pad of wool and a little hair. The eggs, which are white tinged with green and spotted round the larger end with pale pinkish brown, measure on the average ·65″×·48″. These birds were common at this time round Niti, and were seen as high as 14,000′ near Rimkim in an adjoining valley, but I did not find any other nests. During the winter months they extend their range over a large part of north Garhwal and are found at least as low as 5,000′ elevation.

Fringillauda sordida (787).—Stoliczka's Mountain-Finch.

This bird breeds in the tract of country lying north of Niti village on the borders of Tibet. They were seen here during the latter half of July and early in August frequenting the open grassy slopes between 13,000′ and 14,000′ elevation. On several occasions I came across them in small flocks the members of which did not appear to have commenced nesting operations, but on 3rd August I found two nests at 13,500′ elevation one of which contained 3 and the other 4 freshly hatched young ones. The nests were placed within natural crevices which had formed beneath large stones half-buried in the ground surface on steep bare slopes. As the nests were situated some 6″ from the entrance they were practically invisible from outside. They were shallow cups composed of dry grass stems and lined with a few feathers. In winter these birds congregate in large flocks composed of 50 to 100 individuals and are found down to 7,000′ elevation.

Emberiza stracheyi (794).—The Eastern Meadow-Bunting.

During the breeding season this bunting is very abundant on open grassy or, bush-clad slopes at elevations from 9,000′ to 11,000′. I have also found a nest as high as 13,500′ elevation in the dry interior hills bordering Tibet. Blanford says it breeds from 4,000′ to 9,000′, but in Garhwal I have never found a nest below 8,000′ which is certainly I think the lowest level at which it breeds at all commonly here. The nest is placed on sloping ground and is usually more or less concealed by some small shrub, but may be merely placed beneath a tuft of grass. It is a cup constructed of dry grass and lined with a little hair.



Chir Forest (*Pinus longifolia*).

Deodar Forest.

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Chelidon nepalensis (807).—Hodgson's Martin.

A colony of these birds breeds every year on some cliffs at 7,000′ elevation in the vicinity of Lohba in central Garhwal. In 1913 I obtained eggs on 19th June, but in many nests the young had then already hatched. There were from 50 to 100 pairs of birds breeding together here, and in one favoured spot I counted 50 nests built over a space of about two square yards, most of the nests actually touching one another. The cliff where the birds were nesting is in the middle of banj (*Quercus incana*) forest, and during the winter it is frequented by rock pigeons. The nests were placed on parts of the cliff where the surface shelved slightly outwards from below. They were shaped like large mud saucers with a small hole to one side. A specimen which I shot was identified for me at the British Museum. Blanford's description of this bird reads "Bill brown, paler at gape;" but in my description I have recorded "Bill black. Inside mouth nearly white."

Ptyonoprogne rupestris (810).—The Crag-Martin.

Towards the end of May 1914 I found two freshly built nests of this species along the Girthi valley in Painkhanda Malla at an elevation of 10,500′. They were unfortunately built against an overhanging rock in such a position that I was unable to reach them. In August 1916 these birds were very common at 13,500′ elevation near the border of Tibet.

Hirundo nepalensis (822).—Hodgson's Striated Swallow.

During the breeding season this bird is found all over the outer and central ranges at least as far north as the Pindar valley. On 10th June I found a nest with 4 eggs placed against the lower surface of a large overhanging boulder on a steep hill side where the boulder was half hidden by bushy scrub, and again on 18th June I found a nest with 3 hard set eggs in a bungalow verandah, the nest being placed in the angle formed by the verandah roof with the outer wall. The first of these nests was at 4,000′ elevation and the second at nearly 7,000′. The nests were retort-shaped and 10″ to 12″ long and were lined with a few scraps of dry grass and feathers. The parents of both were identified for me at the British Museum.

Anthus rosaceus (850).—Hodgson's Pipit.

During the breeding season this bird is found in abundance all over the high-level grazing grounds which lie above the limits of tree forest along the outer slopes of the high snowy ranges between 11,000′ and 13,000′ elevation. I did not however come across it in the dry interior hills situated along the Dhauli valley. Six nests with eggs were found on varying dates between 26th May and 26th June. The nest is a shallow cup of dry grass (lined with hair of the musk deer in one of the nests) placed on the ground in a slight depression beneath a tuft of grass or occasionally half hidden by some small shrub. The parents in two cases feigned a broken wing when flushed from the nest. One clutch was restricted to two eggs only, but all the others contained three. The clutches of 3 eggs each averaged as follows:—·85″ × ·60″, ·85″ × ·61″, ·87″ × ·61″, ·80″ × ·59″ and ·83″ × ·60″. The eggs are white tinged with grey or brown and more or less thickly marked all over with shades of colour varying from sepia to chocolate brown.

Oreocorys sylvanus (853).—The Upland Pipit.

This pipit occurs in considerable numbers practically throughout the hills. Steep grassy slopes interspersed with bushes or broken up by rocky ground are its favourite haunts, and it is also common in open chir (*Pinus longifolia*) forest where there is always abundance of grass. This bird has a characteristic monotonous song of two rather prolonged notes which might be written "See-saw." Two nests containing eggs were found on 13th April and 12th May.

Gecinus squamatus (946).—The West-himalayan Scaly-bellied Green-woodpecker.

This woodpecker is found over practically the whole of the hilly portion of Garhwal between 5,000′ and 9,000′ elevation and throughout its range it seems to be far commoner than *G. occipitalis*, which is also found. Its call is loud and highpitched, normally consisting of two notes, but occasionally only one and sometimes three.

Dendrocopus auriceps (969).—The Brown-fronted Pied Woodpecker.

This bird is extremely common throughout Garhwal in almost all forests below 7,000′ elevation. I discovered an interesting fact in regard to their diet, namely that they eat considerable quantities of the seed of the chir pine (*Pinus longifolia*). Another woodpecker I have observed eating chir seed is *Dendrocopus himalayensis*, and the latter species spends considerable time and energy in breaking open the cones some months before they naturally open to let the seed escape.

Cyanops asiatica (1012).—The Blue-throated Barbet.

Very common in the foot hills and low outer valleys as far north as the Nayar river. Beyond this I have only observed it along the main valley of the Alakhnanda where it occurs as far north as Rudrapryag.

Coracias indica (1022).—The Indian Roller.

This bird is seldom seen in the interior of the hills and I was much astonished to find it at 4,500′ elevation near Gwaldam in the Pindar valley. This was in June and I am unable to say whether these birds are resident here throughout the year, but I think it improbable.

Merops viridis (1026).—The Common Indian Bee-eater.

I have seen this bird in July on the sandy banks of the Alakhnanda river between Karnpryag and Nandpryag, and it is found all along the Alakhnanda valley up to this point which is over 100 miles from where the river leaves the foothills.

Halcyon smyrnensis (1044).—The White-breasted Kingfisher.

This kingfisher penetrates a considerable distance into the hills, namely as far as Nagnath and the Pindar valley, and here I have seen it as high as 5,500′ elevation.

Cypselus pacificus (1071).—The Large White-rumped Swift.

Blanford does not include any point west of Assam within the distribution of this species. On 21st May 1913 I shot several specimens in Garhwal and one of the skins was kindly identified for me at the British Museum. When I shot them they were apparently on migration, as for three days in succession they were observed between 5 and 7 p.m., to pass northwards over a pass at 8,000′ in upper Garhwal called Lohajang. They kept flying over in small parties of 3 or 4 birds at a time, and always in exactly the same direction. An examination of their crops revealed the remains of winged termites.

Caprimugus monticola (1090).—Franklin's Nightjar.

This nightjar frequents scrubby forest along the outer ranges at elevations up to 4,000′ and possibly higher, and here it occurs in large numbers during the breeding season. It seems to have a special predilection for the broad dry stony stream beds which are a marked feature of the outer hills. Its call during the breeding season is a loud piercing " tweet " uttered both when the bird is on the ground and when flying. I never heard this species make any call resembling that of *C. asiaticus* as stated by Blanford. As far as I have observed neither this species or *C. macrurus* penetrate far into the hills ; probably not beyond the limits of sal forest, or the Nayar valley, which are approximately coincident.

Caprimulgus indicus (1095).—The Jungle Nightjar.

This nightjar is very abundant in the low outer hills during the breeding season. At this time the call of the male is a single note repeated very fast 4 or 5 up to about 15 times together, followed by an interval. The note is similar in character to that of *C. macrurus* and may be likened to the noise produced by striking wood with a hammer, the call note of *C. macrurus* is however repeated very much slower. The jungle nightjar has also another note, not heard

A Forest-clad Ravine at about 10,000.'

Dunagiri Peak 23,200.'

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at any great distance, which almost exactly resembles the " whish-whish " of the wings of some powerful bird of flight. They penetrate well into the hills and on 21st May I found a clutch of 2 eggs at 4,700′ elevation only a few mile south of Chamoli.

Cuculus canorus (1104).—The Cuckoo.

This cuckoo may be heard from the middle of April onwards at almost any elevation up to 13,000′ throughout the whole district. In June I heard it up the Dhauli valley in the vicinity of Niti and Malari villages though I heard no other species of cuckoo in these parts, not even *C. poliocephalus*.

Surniculus lugubris (1117).—The Drongo Cuckoo.

These birds are very common in the outer hill ranges between 3,000′ and 4,000′ elevation during May, at which season their monotonous call is constantly heard in open forest areas. Blanford quotes Legge as stating that the flight is straight and that it has a remarkably human whistle of six ascending notes. As regards the flight I cannot agree that it is straight, and I should rather compare it to the dipping flight of a magpie ; nor does the bird flap its wings in a regular and continuous manner as do most of the cuckoos with a straight flight. After listening to the call of a large number of birds I found that it most frequently consists of 5 ascending notes, but that occasionally it utters as few as 4 or as many as eight. The furthest north that I have heard this bird is in the Pindar valley at 5,600′ elevation.

Coccystus coromandus (1119).—The Red-winged Crested Cuckoo.

On 3rd May I shot one of these birds in the outer hills at 4,000′ elevation. This is the only bird of this species which I have seen and the record is an extension of its range as given by Blanford.

Bubo bengalensis (1168).—The Rock Horned Owl.

In November 1913 I shot one of these owls in the Pindar valley at an elevation of 5,500′.

Columba intermedia (1292).—The Indian Blue Rock Pigeon.

This pigeon is found all over the district, but is most numerous along the Ganges valley above Chamoli and thence right up the Dhauli valley as far as Niti village. The innumerable cliffs which here drop sheer down to the river banks from a height of many hundred feet constitute ideal surroundings. They are often seen in large flocks of over 100 birds, and being seldom shot, they are usually not very difficult to approach. Some birds have a distinct pale band about 1½″ wide on the lower back, but the band is always pale grey and never white as in *C. livia*.

Columba rupestris (1294).—The Blue Hill Pigeon.

After I had left Niti village some miles to the south I found this bird fairly common along the path leading over the Chor Hoti pass into Tibet. This was during the months of July and August when the Bhotias and Tibetans are busy bringing over merchandise from Tibet and carrying back grain packed on the backs of their sheep and goats. A certain amount of grain drops out of the packs, and pigeons take full advantage of this easy method of obtaining their food. They are extremely tame and will let anyone approach within a few yards before flying on. I saw them here at elevations between 13,000′ and 17,000′, and always either singly or in pairs. Some females I shot had ovaries in such an advanced stage of development that they would certainly have laid in a few days. I took the measurements of four females and it appears that birds here are rather above the average size. Stuart Baker in his "Indian Pigeons and Doves" says that the average wing measurement for females is 8·73″, though the largest have a wing up to 9.2″. The four birds I measured had wing measurements of 9·2″, 9·3″, 9·4″ and 9·55″ respectively. Except in this dry region bordering Tibet, I have only once shot this species. This was on 6th November when I shot a single bird at 4,000′ elevation near Pipalkoti out of a flock of *C. intermedia*.

Columba leuconota (1296).—The White-bellied Pigeon.

In Stuart Baker's Indian Pigeons and Doves there are two remarks concerning this pigeon which I should like to criticise. In the first place he says that they are apparently never seen below 5,000′. This remark is not quite correct for Garhwal where they constantly descend to 4,000′ in the Pindar valley opposite to Gwaldam during the winter months, in fact there is a large cliff here facing the Pindar river at a little below 4,000′ elevation to which snow pigeon regularly resort at this season. Then he remarks a little further on that it is entirely a rock-pigeonin its habits, and only very severe stress of weather will drive it into forested country. With this remark I also cannot fully agree. It is certainly mainly a rock-pigeon in its habits, but I have constantly found it throughout the cold weather in forested country, in fact at this time of year in Garhwal these pigeons live mainly in tracts which are covered with forest. At the same time I do not mean to imply that they actually feed about inside the forest. They feed at all times in the open, either in cultivated fields or on more or less bare grassy slopes but the immediate surroundings are frequently well forested, and during the day time they often sit for hours in some tree at the edge of the forest. The habits of snow pigeon in Garhwal differ somewhat according to the time of year. In December, January and February which are the coldest months they live very largely in flocks of 50 to 100 birds at elevations between 4,000′ and 7,000′. In the Pindar valley at this time of year they roost amongst steep cliffs bordering the river itself. Early in the morning they come to feed on the stubble and about 10 o'clock return to the cliffs where, after a drink from the river, they seem to remain for the rest of the day. Sometimes a flock will sit the greater part of the day in some large chir tree near their roosting cliff. The crops of pigeons which I examined at this time contained small quantities of barley and other grains, but much larger quantities of the seed of a leguminous plant *Vicia sativa*, Linn., which is common in cultivated fields. They never seemed to feed on crops which had germinated but only on bare stubble. When feeding in this manner they keep rapidly on the move and often form up in a close phalanx moving forward over the ground like a flock of sheep, each bird trying to rival with his neighbours in being the first to investigate new ground. During April and May the flocks are usually seen from 7,000′ to 10,000′,and at this season they retire to roost amongst cliffs approximating the latter elevation. At about 7 a.m., they may be seen arriving on the stubbles which will probably be somewhere between 7,000′ and 8,000′ elevation. They appear in pairs or small parties of half a dozen or so, but they soon all join on the feeding grounds to form small flocks. They were usually seen drinking between 8 or 9 in the morning and about 10 o'clock they commenced to work upwards again towards their roosting quarters though they seemed to feed largely throughout the day at elevations between 9,000′ and 10,000′, where they investigate patches of bare ground from which the snow has only recently disappeared. They do not return to lower feeding grounds in the evening.

Dendrotreron hodgsoni (1297).—The Speckled Wood-Pigeon.

This is rather a rare pigeon in Garhwal and I have only seen it in the north of the district, and here always in well-wooded parts at elevations between 7,000′ and 9,000′. I have never seen more than 6 birds together at a time. Its native name is " Bhekala " which is also the name for *Prinsepia utilis*, a small thorny shrub which has a bluish black fruit like a small plum. The pigeons are particularly fond of this fruit which in fact seems to be one of their principal foods, and it is on this account that the native name for the shrub and the bird are identical.

Palumbus casiotis (1298).—The Eastern Wood-Pigeon.

Stuart Baker in his "Indian Pigeons and Doves" quotes Hume to the effect that these pigeons appear in this part of the Himalaya about the beginning of November and stay until the middle of April when they depart for other quarters, and

then he goes on to remark that this curious local migration is probably governed by the birds' food supply. These statements I can fully confirm from my experience of their occurrence in Garhwal, only I would add that in Garhwal they do not seem to appear at all in four seasons out of five. During my ten years' residence in this district I only saw this species in two seasons. One of these was the winter of 1917-18 when there were immense quantities of banj (*Quarcus incana*) acorns, and during this winter from the beginning of December up to the end of March they were to be seen in flocks of 50 to 100 birds in practically every banj forest in the district, generally at about 6,000′ elevation. The last date on which I saw them was 3rd April. I examined the crops of several birds and nearly always found them full of *banj* acorns, as many as 47 being taken from a single bird's crop, and I feel sure that these acorns are the principal attraction which affects their migration to these parts. They also eat the seed of the chir pine of which I have taken 85 seeds from a single bird's crop, and green leaves and shoots are also not infrequently found to have been eaten, though I never succeeded in identifying the plants to which they belonged.

Turtur ferrago (1305).—The Indian Turtle-Dove.

During the breeding season this dove is extremely abundant in all well-wooded parts of the hills at elevations between 5,500′ and 10,500′. Blanford says that it breeds at elevations from 4,000′ to 8,000′, and Stuart Baker whilst quoting a record of a nest found at 8,500′ does not suggest that the usual height at which they breed may exceed 8,000′. I am, however, quite convinced that they breed in Garhwal in large numbers as high as 10,500′, as in June they are quite common up to this height though they perhaps do not go much higher. That I never actually found a nest above 8,000′ was I am sure merely because I never looked for their nests and did not happen to come across one.

Gallus furrugineus (1328).—The Red-Jungle Fowl.

Jungle fowl are found only in the outermost ranges and do not penetrate further than the Nayar valley which lies just north of Lansdowne. In this respect their distribution here corresponds with that of the pea fowl.

Catreus wallichi (1333).—The Cheer Pheasant.

A morning bag at 7,000′ 8 Cheer Pheasant and one Kalij.

The cheer is widely distributed in Garhwal, but is very seldom indeed found in any numbers. Its favourite haunts being steep grassy slopes from 5,000′ to 8,000′ elevation, and ground of this description apparently well suited to cheer occurring over very large areas, I have often wondered why this bird should not become more numerous. I am inclined to the belief that annual forest fires, which usually occur just about the time these birds are breeding, must be the principal check to their further increase, and I believe that this fine pheasant will become very much more plentiful now that large areas of chir pine forests are yearly closed to fire by the Forest Department to enable the forests to be successfully regenerated. Blanford's distribution of this bird is distinctly misleading so far as Garhwal is concerned. They are quite as common in the interior valleys as they are in the outer hills, in fact more so ; for they even penetrate up the Dhauli valley as far as its junction with the Rishi Ganga, and are also not uncommon along the Vishnu Ganga. Wilson's description of this bird as quoted by Stuart Baker in his work which is now appearing in this Journal seems to me extremely good, and I am inclined to agree with Wilson when he says that the cheer generally roosts on the ground, as I have spent some time trying to discover their habits in this respect. Nothing is more characteristic of this bird than the way it invariably calls at daybreak and again at dusk as mentioned by Wilson, and the early morning call is often made when it is still too dark to perceive objects more than a dozen yards away. I have also once heard these birds continue calling for about ten minutes at midnight. The marked predilection these birds exhibit for running away up—hill instead of taking to their wings to escape danger was well shown on one occasion when several cheer started up only 4 or 5 yards away from my feet on an open burned grassy area and immediately sought safety by running away up the hillside without making any attempt to fly.

Gennæus albocristatus (1336).—The White-crested Kalij Pheasant.

The kalij is by far the commonest pheasant throughout Garhwal in all forests below 8,000′ except such open grassy slopes as are especially adapted to the cheer. It is found up the Dhauli valley leading to Tibet at least as far as its junction with the Vishnu Ganga, and possibly further, though I have no actual record of its occurrence further north than this. On several occasions I have examined the crops of these pheasants, and besides many kinds of roots which were seldom identifiable for certain I have found the following : *Banj* acorns with the outer husk removed, the ripe fruit of *Pyrus Pashia*, the green stems of *Viscum japonicum*, pods of *Desmodium tiliæfolium*, bulbils of species of *Dioscorea*, ripe fruits of *Rosa moschata* and the ripe seeds of *Nyctanthes arbortristis*. In most cases the food is quite clean and free from suspicion, though I regret to have to record that in the vicinity of travellers' paraos and human habitations this is by no means always the case.

Lophophorus refulgens (1342).—The Monal.

As indicated in Stuart Baker's work which is now appearing in this Journal the monal is still tolerably common in parts of British Garhwal. In the Dudatoli forest and along the Dhanpur ridge in central Garhwal monal are still to be found, but they are scarce, and it is not till one reaches the spurs which diverge directly from the main snowy range that they become at all abundant. Along the Dhauli valley leading to the Niti pass I have seen them as far as the village of Malari, but not north of this. Blanford and Stuart Baker both state that monal are found up to 15,000′ during the breeding season, but I have never seen them above 13,000′ in Garhwal and I much doubt if they ever wander in Garhwal above this elevation. It must be remembered that the tree limit in Garhwal usually lies between 11,000′ and 12,000′, whilst in the eastern Himalaya I believe it is not less than 13,000′ and as the monal is really a forest bird this fact would be quite sufficient to make a difference of 2,000′ in the maximum height at which the birds are to be found. Stuart Baker says that in summer time they are generally to be found

from 10,000′ to 14,000′ elevation, but for Garhwal I should say without hesitation 9,000′ to 12,000′. The same author states that in winter they descend to 6,000′ and even 5,000′, but under the most severe conditions of weather I have never seen a bird below 6,500′, and the normal elevation for this time of year would be 8,000′ to 10,000′. As regards the destruction of these birds for their plumage no such case has ever come to my notice in Garhwal where I believe this practice does not now exist. Hume's note on the food of this bird agrees with my own observations, and I might add that the monal is very fond of the ripe fruit of *Cotoneaster microphylla*.

Tragopan satyra (1344).—The Crimson Horned Pheasant.

I have only met with this pheasant on two occasions, one was near the village of Wan and the other in the Nawali reserve. Both these places are within the water-shed of the Kail Ganga and situated fully 20 miles in a direct line east of the Alakhnanda river, which has hitherto always been quoted as the western limit of this bird. On both occasions the birds were frequenting dense ringal forest.

Arboricola torqueola (1362).—The Common Hill-Partridge.

This partridge is found at suitable elevations throughout the hills. It is commonest in dense forest of banj (*Quercus incana*) from 6,000′ to 7,000′ elevation. As a rule few birds are seen during a dav's excursion, though in specially favoured localities perhaps two dozen or more birds may be flushed within an area of a few acres. Such favoured localities occur where the gradients are not too steep and there is a rich moist humus beneath dense forest of oak, laurel and other evergreen trees and shrubs. They usually run when first disturbed, and a dog may have to follow a considerable distance before he comes up with one of these birds when it is running on ahead ; but when they have once been flushed they almost invariably sit very close, and this is especially the case if they have been already fired at and missed.

Francolinus vulgaris (1372).—The Black Partridge.

The Black Partridge is widely distributed all over Garhwal, and at Wan I have observed it at an elevation of 8,800′ which is unusually high.

Tetraogallus himalayensis (1378).—The Himalayan Snow-Cock.

In summer this bird not uncommonly descends to 8,000′ elevation, but never to my knowledge enters forests of any description. It is never found away from those spurs which diverge directly from the main Himalayan range, though a few birds annually frequent the bare slopes above Kheta in the Pindar valley during the winter months. I have never seen it in any numbers except in the tract lying north of Malari and Niti where it is fairly common and a great source of annoyance to anyone attempting to approach the wary burhal. In the early spring I found it feeding on a small grass-like herb *Gagea lutea* which grows in large quantities round deserted habitations and old camping grounds. When disturbed these birds, unless at very close quarters, usually commence to run away up hill and continue to climb till they have reached a point of vantage on some high ridge or projecting rock whence they probably make an extended flight. I have seen them make flights of fully a mile, often straight across some wide intervening valley, and whilst on the wing they seem invariably to utter a whistling note. When running away up hill they carry their short tails rather high up so as to show the white feathers beneath, and at this time their waddling gait is distinctly reminiscent of a goose. From the middle of May onwards they are found in pairs usually at elevations from 12,000′ to 14,000′. The breeding call is a prolonged whistle uttered with great persistence. The male when courting pursues the female in a crouching position with his tail held vertically up in the air. After a few minutes of this courtship they probably both take to their wings making a loud wild whistling cackle as long as the flight continues.

Lerwa nivicola (1380).—The Snow-Partridge.

This partridge is never seen in large numbers though it is by no means rare. The breeding call is very similar indeed to that of the common grey partridge of the plains, but when alarmed a single whistle is uttered.

Scolopax rusticola (1482).—The Woodcock.

Though similar cases have I feel sure been frequently recorded, the following note written 28th June 1914 at Kulara, a camping ground at 10,500′ elevation in Painkhanda Malla, may still be of some interest: "The forest here is mostly composed of silver fir with a fairly dense undergrowth of shrubs. As I was walking through the forest to-day a woodcock got up from a few yards off, flew some ten yards and then began to flap its wings wildly and to scream as if something was killing it. I was completely taken in by the ruse and rushed up to where the bird was. But when I got a few yards off it flew on another ten yards and repeated the trick. It did this several times, and finally flew some distance away. I went back and sat down in concealment close to where I had first seen the bird. In about one minute she came running back through the undergrowth, and was at once met by one of her young ones. In another minute I showed myself and the mother flew off some 20 yards as before. I found the youngster crouching under a log. Its quills were just emerging from their sheaths."

During May and June woodcock may usually be seen round kharaks (cleared camping grounds in the forest where sheep and goats are temporarily located for grazing purposes) between 9,000′ and 11,000′ elevation. Both at dusk and again at dawn they may be observed slowly flapping across the open spaces and uttering at frequent intervals a bat-like squeak. In the winter they may be found at almost any elevation from 5,000′ upwards, but owing to the steepness of the slopes and the comparative absence of flat marshy ground woodcock are never found in any abundance, and it has seldom been my fortune to see more than a couple of birds during a day's march.

Gallinago solitaria (1486).—The Himalayan Solitary Snipe.

I have shot this bird on very few occasions as they are not at all common. In May and June, at which time they might possibly be breeding, I have twice met with them along stony beds of streams at about 8,000′ elevation. I have never seen or shot the wood-snipe, *Gallinago nemoricola*.

Phalacrocorax carbo (1526).—The Large Cormorant.

This bird is not uncommonly seen along the Alakhnanda and its main tributaries, the Mandagini and Pindar.

SHAKESPEARE ON THE NOBLE ART OF HAWKING.

BY

LT.-COL. C. E. LUARD.

Hawk classe

The Hawker's sporting toast : " A health to all that shot and missed ".

Two classes of hawks are used for hunting, the true falcon or long-winged hawk and the short-winged hawk : the peregrine par excellence representing the former and the goshawk the latter. Shakespeare is always most careful never to confound these two and everywhere his terms show a genuine and absolutely accurate knowledge of the sport. Such accuracy disappeared when hawking went out as a general sport, and only Chaucer, Spenser and lastly Dryden show that they also knew well what they were writing about. The females among hawks are usually the larger, and hence the males were called " tassels " or " tiercels," being about one-third less than the size of the female. The male peregrine was called the " tiercel-gentle ", a compliment to his noble character, which explains Juliet's use of the term of her lover (R. & J. : II-ii-159). Shakespeare names the falcon, tercel-gentle, the estridge or goshawk, and her tercel, and the musket. The big gerfalcon did not do well in the damp of England and was little used. The " musket " was the male sparrow-hawk, and had the least repute, especially as an "eyass"* (M. W. W.: III-iii-22). Ignorant commentators changed "estridge" into " ostrich ", and made nonsense of the line " the dove will peck the estridge" (A. & C. III-ii-195) so too in Henry IV we should follow the folio reading

Tiercels.

Note.—The Oxford Dictionary has gone wrong here calling the young and female of a goshawk a "faicon gentel."

Estridge.

Musket.

* Fr. niais, a nestling-foolish young thing.

Eyass.

Bate.

> all furnished, all in arms
> All plumed like estridges, that with the wind
> Bated, like eagles having lately bathed

The reading " baited " makes nonsense ; " bated " means beating their wings, fluttering.

Mews.

Hawks were kept in the " mews ". To " mew " is to moult, (Fr. muer, Lat. mutare). The Royal Stables in St. Martin's Lane were built on the old " Mews " site and after them, all London stables have been called mews. Hence the use of the word to mean shut up (T. S. I-i-87 ; MND : I-i-71 ; KJ : IV-ii-57 ; R. III, I-i-38, 131 ; R. & J : III-iv-11). The hawks each had a perch on a pole where they stood " weathering ". They were attached by thongs which were fastened to flat silver rings called " varvels " which were fastened to soft leather bands on the feet called " jesses " (R. & J. : III-iii-261) ; when out of doors the thong was held by the falconer.

Weather.

Varvels.

Jesses.

Falconer.

A " falconer " is a man who deals with the long-winged hawk or falcon, of which the peregrine was the finest. The man in charge of the short-winged hawk, favoured in France, was called an " astringer " or " ostringer ", from the estridge or goshawk which he chiefly used (Fr. austour, autour ; Lat. astur). Thus all falcons are hawks, but not all hawks are falcons. The methods of attack of the two birds, as Shakespeare well knew, are totally different. The falcon attacks from high up, is used in open country and " towering in her pride of place" (Mac.: II-iv-12 ; Luc.: 506) " stoops " or " swoops " upon her quarry, while the short-winged hawk being used in woodlands flies after the bird, threading its way among trees and bushes. The falcon is recovered by the lure, the goshawk returns to his master's wrist just as in nature he would to his perch on a bush.

Astringer.

Tower pride of place.

Lure.

Classes using hawks.

The peregrine was held the hawk of an earl, the goshawk of a yeoman, and French falconers even now distinguish the two arts as " fauconnerie " and " autousserie ". The French were expert at the use of the small hawk, and were rather looked down on by English professors (Ham: II-iii-58), for flying at every thing, but Tubervile, the old writer on hawking, always quotes them in reference to short-winged hawks. Hence the appropriateness of introducing " a gentle astringer " into the French court (Alls Well : V-i-7) changed by some commentators into " a gentle stranger " ; in this case he is a man of gentle blood and as such a favourite at court.

Astringer.

Training.

Falcons were trained by two methods, either, that is, by taking a nestling or " eyass " (Fr. niais) or a full grown bird in its first mature plumage. The latter makes the keenest hunter, as she has already been taught in nature's school in which hunger is mistress, while the other, brought up by hand, has no such knowledge. Moreover, the eyass, though quite tame, is more difficult to train, and is querulous like a small child (Ham: II-ii-363), and indeed Baert (1619), the writer on training hawks, says," he that meddleth with an eyass will spend his time to no purpose ". So you should prefer to train a " haggard " or wild hawk, that is a hawk after its first moult ; but sometimes she remains haggard (Oth : III-iii-260), she is wayward and is always " checking " or going after some fresh quarry (T. N., II-v-72 ; Ham. : IV-vii-62); such " proud disdainful birds " are hard to reclaim (T. S. : IV-ii-39). To tame a haggard it must be starved of food and rest, being watched and kept awake (M. W. W.: V-v-109 ; Oth. : III-iii-22); and also constantly handled (V. & A. : 560). But the haggard, so hard to deal with (Much Ado. : III-i-35) is when once tamed far more affectionate than the eyass and more constant (ibid, 109).

"Haggard."

Checking.

Hoods.

The falcon must be taken out hooded, as she remembers the past and gets excited, while the eyass with no recollections of wild life needs no hood. If not hooded, the tamed haggard will " bate " (Fr. se battre) or flutter and beat its wings in eagerness (T. S. : IV-i-99 ; 1 Hen. IV-iiv-99, where read " bated " with folio and not " baited "; R. & J. : III-ii-10 ; Hen. V, III-vii-121).

Bate.

Treatment of hawks.

The kite or " puttock " was despised (T. S. : IV-i-198 ; R. III, I-i-133 ; Cymb : I-i-140). Petruchio (a Gloucestershire gentleman masquerading as an Italian) gives us a regular resumè of the proper treatment of hawks (T. S. : IV-i-191 to 214). Fletcher who wrote: " The Woman's Prize" as a sequel to this play carries on the simile in a passage spoken by one of the female characters, Maria, who is not unnaturally answered, " You are learned, sister ".

Other raptores.

In the same category as kites came kestrils (Cym. : I-i-140) which though long-winged are hopeless cowards) buzzards (Rich. III-I-i-132) and hen-harriers : for these Shakespeare had the true falconer's contempt (T. S. : IV-i-198). The kestril is also called the " staniel ", (T. N. I-iii-43 ; II-v-126) or " coystril."

Seel.

The eyes of newly caught haggard falcons were " seeled ", that is closed by a silken thread drawn through the eyelids (Oth. : I-iii-271 ; III-iii-210). The bird so blinded struts about in a comic way (A. & C. : III-xi-112) to the amusement of those looking on. Occasionally a hawk loses feathers, these, if wing feathers, must be replaced, hence they were replaced by " imping." The stump of the broken feather being rejoined to the old upper part or to a new feather, of which a large stock was kept, by inserting a thin flexible iron wire into the piths ; this was dipped in brine to make it rust, the rust forming an adhesive (T. & Cr. II, II-i-292). To restrain a wild hawk, feathers were removed (J. C. I-i-77).

Imp.

Weather for hawking.

A clear day, not too hot, and above all without a strong wind (2 Hen. VI, II-i-3) in which a hawk may be lost, must be chosen for the sport unless you wish to get rid of a useless haggard (Oth. : III-iii-262). The hawk must be starved on this day or he will not hunt (1 Hen. VI, I-ii-38, V. & A. 55 ; Luc. 694)

Starving.

Cadge. Knave.

The hawks were brought out on a frame called a " cadge ", carried by the " cadger ", whose lowly occupation has led to his being classed with a " knave " (a menial servant Ger. knabe). We may suppose a flight made for a partridge. This was done with a dog. The spaniel " Troilus ", some favourite. may be of Shakespeare (T. S. : IV-i-152), is called up and sets at a covey. The hawk is then set free and soars up in circles until she has made her point and reached her full "pitch " (1 Hen. VI, II-iv-11 ; 2 Hen. VI, II-i-6 ; J. C. I-i-87 and figuratively Rich II, I-i-109 ; T. A. II-i-14 ; R. & J. I-iv-28 ; J. C. 8-i-78 ; Son—lxxxvi ; and as to height in general, T. N. I-i-82 ; 1 Hen. VI, I-iii-55 ; Rich. III, II-i-vii-188 ; Son : vii). Thus soaring (Mac. II-iv-12 ; Luc. 506) she reaches " her pride of place" and there waits or "towers". The dog is now set on and off go the birds,

Making a point—pitch.

Pride of place towering.

the hawk at once selecting its bird and stooping (T. S. IV-i-194) or swooping (Mac. IV-iii-219) " foots " the quarry (Cym.: V-iv-116) and " souses" it, that is, seizes it with her talons (K. J. V. ii-150) and starts to " tire " on it or devour it (3 Hen. VI, I-i-268 ; Tof A. III-vi-5 ; V. & A. 55 ; Luc. 417) so as to " disedge" its appetite (Cym. : III-iv-96 : Ric. II, I-iii-296 ; Ham. III-ii-264). If the dog is let go too soon to rouse the birds, before the falcon has reached her pitch, she may miss (2 Hen. VI, II-i-44) and must be recalled (T. S. IV-i-42 ; Ham. I-v-115) or lured back (R. J. I-ii-159). The lure was a sham bird made with pigeon's wings to which a piece of meat, the " train ", was attached (Mac. IV-iii-117, and hence " to train " in C. of E. III-ii-45 ; K.J. III-iv-175 ; 1 Hen. IV, V-ii-21 ; 1 Hen. VI, I-iii-35 ; TA. V-i-104).

Foot.
Souse & tire.

Lure train.

The falcon had bells on her feet which assisted in cowing (3 Hen. VI, I-i-45 ; Luc. 510) or " enmewing " the birds (M. for M. III-i-89). They also indicated where she was (Alls-Well, III-iii-80). This sport took place in open country over the fields or " acres " (1 Hen. IV, I-i-125) divided up by " balks " or heaped up mounds (1 Hen. IV, I-i-69).

Bells enmew.

The stoop of a falcon is done in one rush full of confidence (Ric. II, I-iii-67 ; V. & A. 1027). While the falcon or female is required for all bigger and more difficult game, the tercel can be used on duck (T. & C. III-ii-55).

Stoop.

The short-winged hawks are used as noted above for woodland work, they start from the hand and return to it. Instead of swooping they follow the bird in a stern chase, lurching from tree to tree and then, on sighting the game, shoot forward, whence the term " musket " passed on to a gun, being applied to early fowling pieces.

Musket.

In hawking a " hawking eye " is useful (Alls-Well, I-i-105) ; to " tell a hawk from a handshaw (heron) ", no easy thing when the hawks are attacking and the birds are between you and the sun (Ham. II-ii-397) ; a common trick with herons it seems, as an old French writer says, he purposely flies thus (pour se couvrier de la clarte).

Reverting to the mistakes often made in dealing with hawking. Scott makes goshawks soar, and his falcons are males (see the Abbot, Ivanhoe, Rob Roy) Tennyson and Morris in their poem on this bird make it a male. As regards the Bacon-Shakespeare myth, from Bacon's writings his attitude to such sports is that of his relative Burleigh of whom Fuller recounts that when taken out and kept standing during a check he exclaimed "What call you this "—"Oh now the dogs are at fault "—" Yea take me again in such a fault and I'll give you leave to punish me."

A hawk had to be purged of his " ensayne " or grease (Ham. III-iv-92) for this he was given a mixture of fur and feathers which acted as an emetic or purge, called " castings " (MWW, III-i-91). A hawk was sometimes rolled up in a cloth to keep it from struggling, " mailed" as it was called (2 Hen. VI, I-iv-q 1).

Grease.

Castings.

Mailed.

Small indurated knobs which appear on hawk feet are called " gouts ", but this does not seem to be the use in Macbeth (II-i-45). Other terms are " to hold a wing " (1 Hen. IV-iii-29), in Lear " Oh well flown bird " (IV-vi-32) and to the waste of time in hunting snipe with hawks (Oth. I-iii-9) Merlins and Hobbies were flown at lesser birds. On the Hobby's approach the birds are scared or " dared " and sit still till the fowler catches them. In the absence of a Hobby a piece of red cloth or a mirror was used to secure them (Hen. VIII, III-ii-279). Irish goshawks were famous, especially from Tyrone, whence the saying " Tyrone among the bushes ", and Master Ford had a "fine hawk for the bush" (MWW, III-iii-245).

Gouts.

Note also " croucheth " (Inc : 506) that is makes them cower down : " prune " (Cym : V. iv-118) meaning preen ; "dis-edge," mentioned above is of course to take the edge of one's appetite ; and " cloys "(Cym V. iv-118) that is cleys or, *i.e.*, claws at or cleans his beak on his foot.

The hawks belong to the ornithological Family of Falconidæ which includes the Caracaras, Long-legged hawks, Buzzards, Bearded Vultures, Eagles and Falcons. The falcons are characterized by the strong short bill, suddenly curved from the base, with a tooth like process on each side. Among them are the Ger or Jer falcon (*Hierofalco*), much the largest, the Peregrine (*Falco peregrinus*), the Indian variety of it, the " Shahin " (*F. peregrinator*), the Merlin (*F. æsalon*) and Hobby (*F. buteo*), also the red-headed Merlin (*Æ. chiquera*).

The short-winged hawks such as the Goshawk (*Astur palumbarius*), Sparrow hawk (*Accipter nisus*) belong to the Sub-family of *Buteconinæ*, short-winged and short-tailed generally. The Hen harriers (*Circus*) belong to this group.

The foregoing paper was not originally written for publication, but for a young ornithologist. It is drawn mainly from that delightful but too little known book " The Diary of William Silence " by Professor Madden. If this note leads to its being better known, bird and Shakespeare lovers will alike be grateful, and these few lines will have not been made public in vain. All references are to the " Oxford Shakespeare."

MYRIAPODS FROM MESOPOTAMIA AND PERSIA,

Collected by Mr. P. A. BUXTON

BY

H. W. Brolemann, Pau, France.

(*With two plates.*)

The material collected by Mr. P. A. Buxton, though limited to a few specimens, is far from being void of interest.

A new Lithobiid has had to be inscribed to the Persian fauna. The rediscovery of Humbert and Saussure's *Strongylosoma persicum* offered good opportunity for describing the sexual characters of the female, which were still unknown; such a type of vulva has not been observed before. The capture of a species of the genus *Polyxenus*, most likely to be *P. ponticus*, afforded the possibility of making up for the blanks of Lignau's diagnosis.

For the favor granted in enabling him to put on records such valuable specimens, the author wishes to express his sincerest thanks to Mr. Buxton.

MESOPOTAMIA.

Pachymerium ferrugineum (C. Koch, 1835).

Two female specimens with 55 pair of legs, from Amara; XII, 1917.

Lithobius ? aeruginosus L. Koch, 1862.

Length 10,50 mill.; breadth 1,30 mill.

Tergites 9, 11, and 13 with rounded angles. Antennæ 20-jointed. Ocelli 1+3 in a single irregular row. Coxosternal teeth of maxillipedes 2+2 and strong lateral spines.

Tarsi 1 to 13 single-jointed. Coxal pores: 2, 2, 2, 2. Spinal armature of legs

1st pair	o. o. p. a . a .		occasionally p is to be seen dorsally on the 4th joint.
	o. o. mp. m . m .		
2nd pair	o. o. p. a . a .	or	o. o. p. a p. a p.
	o. o. mp. am . m .		o. o. mp. am . m .
3rd pair	o. o. p. a p. a p.		
	o. o. mp. am . m .		
4th pair	o. o. p. a p. a p.		
	o. o. mp. amp. am .		
5th pair	o. o. p. a p. a p.		
	o. o. mp. am . am .		
6th & 7th pair	o. o. p. a p. a p.	or	o. o. a p. a p. a p.
	o. o. mp. am . am .		o. o. mp. am . am .
8th pair	o. o. amp. p. a p.	or	o. o. amp. a p. a p.
	o. o. mp. am . am .		o. o. mp. am . am .
9th & 10th pair	o. o. amp. p. a p.		
	o. o. mp. am . am .		
11th pair	o. o. amp. p. p.		
	o. o. mp. amp. am .		
12th & 13th pair	o. o. amp. p. p		
	o. o. amp. am . m .		
14th pair	o. o. amp. p. p.		
	o. m. amp. am . a .		
15th pair	o. o. amp. p. o .		
	o. m. amp. am . a .		

An additional dorsal p exists on the 4th joint of legs of 2nd, 6th and 9th pair, but on one side only. No sexual structure on the last two pairs of legs, the last being somewhat swollen (yet not as much as in *L. crassipes*) and bearing a single claw.

Female unknown. A single male specimen from Amara; XII, 1917.

The palearctic members of the same group of *Lithobius* having rounded angles of tergites 9, 11 and 13, ocelli few disposed in rows, and the anal legs without coxolateral spine, without sexual structure and with a single claw, are: *crassipes* L. K., *æruginosus* L. K., *fallax* Mural., *ignotus* Mural., and (possibly ?) *argœnsis* Att. With none of them does the above specimen agree entirely, and nothing is known of the legs of *argœnsis*. Therefore, rather than create a new name for a single specimen, it is deemed wiser to ascribe it to the nearest related form, *L. æruginosus*, in spite of the difference noticed in the spinal armature of the hind legs.

STRONGYLOSOMA PERSICUM Humbert & Saussure, 1869.

The sterno-pleural suture is a curved ridge sharpened on the second segment and gradually rounded backwards; it disappears after the 10th segment. The dorsal furrow of the lateral keels is straight on the non-poriferous segments and sinuate on the others.

The vulvar aperture of the 3rd segment is very wide, rounded laterally; the posterior margin is almost straight and moderately erected. Sternum of the second pair of legs poorly developed, very low and not as wide as the lateral expansions of the coxæ. The posterior surface of the latter is hollowed at the base so as to cause the distal half to appear swollen.

Vulvar invaginations shallow, scarcely deep enough to conceal the vulvæ and hardly distinct from one another. When at rest the vulvæ have the operculum ([1]) turned upwards and the ridge outwards, the posterior end of the mound filling the aperture of the 3rd segment. Vulvæ (fig. 1 and 2) not much longer than deep. Operculum smaller than the mound, excised apically; the distal angles are produced and bear a particularly long and thick macrochæta pointing backwards. Mound with its posterior end abruptly truncate. Outer valve shorter and higher than the inner, the latter being much lower than long. The valves are not fused posteriorly but the upper angles are produced internally into hooks, the concavities of which face each other. Surface of the valves with few and rather short setæ; no macrochætæ. The apodema is sinuous, it shows no superficial ornaments (as seen in *Polydesmus*) and seems destitute of internal appendages. No trace of a shield could be noticed.

([1]) The description of vulvæ having so far been entirely neglected and no English terms having been applied to the different parts of these organs, it is proposed to use provisionally the following:—

operculum = (l'opercule) the smallest, plate-like part of the vulva, theoretically considered to be anterior;

mound = (la bourse) the largest and theoretically the posterior part, the anterior truncate surface of which is covered by the operculum;

valves = (les valves) inner and outer chitinized slopes of the mound bearing setæ and often macrochætæ;

ridge = (le cimier) apical space left between the valves, beginning immediately behind the anterior troncature and extending more or less backwards;

apodema = (l'apodème) gutter-shaped chitinous thickening extending longitudinally below the ridge and communicating with the latter by means of a

slit = (la fente de l'apodème);

diverticula = (les diverticules apodèmatiques) differently shaped appendages of the apodematic gutter, erroneously considered as glands by some authors;

The operculum articulates with the mound by means of

hinges = (les fourches);

shield = (le gorgerin) accessory posterior plate which is often missing and is eventually replaced by some expansion of the valves.

The French terms are those used by Brolemann and Lichtenstein, "Les vulves des Diplopodes," Arch. Zool. exper. gen., LVIII, 4, 1919.

MESOPOTAMIAN AND PERSIAN MYRIAPODS.

Fig. 1.

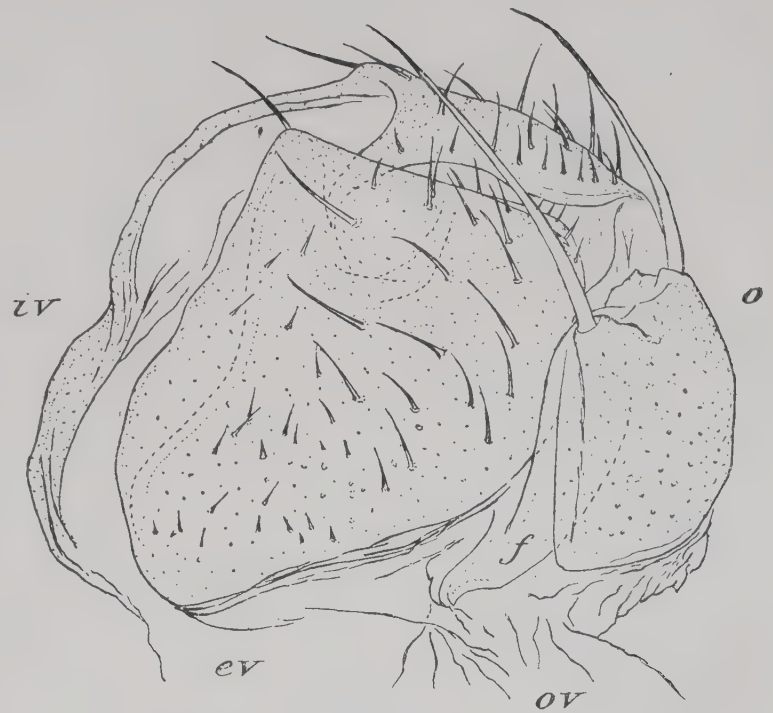

Fig. 2.

STRONGYLOSOMA PERSICUM, H. & S

A sketch of the male gonapods (fig. 3) is added to show the development of the secondary ramus. Attems states that this ramus is formed of two laminæ, a fact which could not be ascertained.

Amara; XII, 1917; 2, I, 1918, "under fallen palm branches"; III, 1918.

PERSIA.

Pachymerium caucasicum Attems, 1903.

One male specimen with 47 pair of legs.

Resht; II, 1919.

Lithobius buxtoni, n. sp.

♂: length about 10 mill.

Colour drab. Head-plate with black margins and a black median spot. Main tergites with black lateral and posterior edges and a black dorso-median line. Mouth-pieces and ventral surface pale yellow. Anterior legs pale becoming gradually fuscate backwards and from the apex towards the base, the last legs being entirely dark coloured.

The cephalic plate as well as the anterior main tergites have their marginal pad entire; this is interrupted mesially on the 7th tergite only. Posterior margin of the 8th, 10th and 15th tergites scarcely or feebly emarginate; posterior margin of the 12th and 14th tergites decidedly excised, the posterior angles being acute and somewhat raised. Tergites 9, 11 and 13 with moderately produced, but sharp angles. Surface of all the tergites strongly rugose and showing oblique, irregular longitudinal furrows.

Ocelli few, 1+3, 2, 2. Antennæ long, 37–40 jointed.

Coxosternum of maxillipedes with the produced anterior margin armed with 2+2 small teeth; no lateral spines could be detected.

Coxal pores 3, 2, 2, 2, small, rounded.

Spine armature of legs of

1st pair	o. o. p. a p. a . / o. o o . am . m .		
2nd pair	o. o. mp. a p. a . / o. o. m . am . m .		
3rd pair	o. o. mp. a p. a p. / o. o. m . am . m .		
4th pair	o. o. mp. a p. a p. / o. o. m . am . m .		
5th to 11th pair	o. o. amp. a p. a p. / o. o. m . am . am .	or	with an occasional p below the 4th joint on P. 10.
12th pair	o. o. amp. a p. a p. / o. o. mp. am . am .		
13th pair	o. o. amp. a p. a p. / o. m. amp. am . am .		accidentally a dorsal m is found on the 4th joint.
14th pair	o. o. amp. a p. a p. / o. m. amp. am . m .		
15th pair	o. o. amp. p. o . / o. m. amp. am . m .	or	o. o. amp. o . o . / o. m. amp. amp. m .

15th pair without coxolateral spine; claw double. No special sexual structure on 14th or 15th pair.

The female is unknown.

Resht; II, 1919.

This new species is to be distinguished from *L. melanops*, Newpt., apparently its nearest relative, by its rugose tergites and by the spinal armature of the legs. The only *Lithobius* so far recorded from Persia is *L. persicus* Pocock, 1899, from Scir. The possibility of identifying the above described specimen with Pocock's species is excluded considering that the latter has only the 13th dorsal plate angularly produced, that the anal leg is armed with O. 3. 3. 1 spines below, with a single apical claw and with a coxolateral spine, and that the legs of the two last pairs are sulcate above in the male.

CHORDEUMOIDEA, sp.

One female specimen from Resht; II, 1919.

IULOIDEA, sp.

One immature specimen from Resht; II, 1919.

POLYXENUS PONTICUS (Lignau, 1903) nob.

Length (without the anal bunch) 8, 50 to 9 mill. Breadth of the 7th segment (including pleuræ) about 0.95 mill.

In most of the morphological details the Persian specimens are identical with *P. lagurus* Latr. The sense cones of the palpi are single-jointed. Ocelli six. Sense calicles of the head disposed in a triangle as in the western species. Also the anal bunches are located alike.

Fig 5.—*Polyxenus lagurus*, Latr.
A to E, setæ corresponding to those represented in fig. 4; F, not observed in *ponticus*.

Fig. 3.
SIRONGYLOSOMA PERSICUM H. & S.

Fig. 4.
POLYXENUS PONTICUS (Lignau) nob.

Yet the setæ are differently shaped. Generally speaking they are more slender and longer in *ponticus* than in *lagurus ;* fig. 4 and 5 show the differences in the corresponding setæ of the head (A and B), of the dorsal rows of the tergites (C and D) and of the pleural plumes (E). Quite striking are the setæ of the posterior marginal row of the tergites ; these are blade-like, with parallel margins, and are neatly arranged side by side in a single line. The setæ of the anterior-marginal rows of the tergites are comparatively shorter and more numerous. The hooked trichomes of the anal bunches are much (almost one half) shorter than the central brush-like setæ ; they show two to five apical lobes, as in *lagurus ;* the five-lobed trichomes appear to be less numerous than the fewer-lobed ones, the contrary being witnessed in *lagurus.*

Enzeli (N. W. Persia) ; VI, 1919.

Whether this is Lignau's true *ponticus* has still to be ascertained. The Russian author (Die Myriopoden der Pontus-Küsten von Caucasus. Odessa, 1903, p. 131 of the German summary) only announces the description to appear in a later work and states that the new species is to be known from *lagurus* through the structure of the antennæ, the setæ of the anal bunch and other particulars (?). Although no difference could be detected in the antennæ (the proportions of which are similar to those indicated by Latzel), it may be assumed that the Persian specimens are specifically similar to those of the Caucasus considering the vicinity of the localities.

EXPLANATION OF PLATES.

Plate I.

Fig. 1.—*Strongylosoma persicum,* H. & S.
The left vulva from above. *o*=operculum ; F=hinges ; *ev, iv*=outer and inner valve ; *c*=ridge

Fig. 2—*Strongylosoma persicum,* H. & S.
The left vulva from without. Same lettering as fig. 1, plus : *ov* = oviduct.

Plate II.

Fig. 3—*Strongylosoma persicum,* H. & S.
Male copulatory leg.

Fig. 4—*Polyxenus ponticus* (Lign.) nob.
Differently shaped setæ : A and B, from the head ; C, from the anterior-marginal rows of the tergites ; D, from the posterior-marginal row of same ; E, from the pleural plumes ; F and G, from unascertained parts of the body and not observed in *lagurus.*

MOTHS OF MESPOTAMIA AND N. W. PERSIA.

BY

VARIOUS AUTHORS.

Note.—Throughout this series of papers the following abbreviations are used for the collectors' names and initials :—

B. T.—Major R. Brewitt-Taylor, R.A.M.C. ; *P. A. B.*—Capt. P. A. Buxton, R.A.M.C.; *Br.*—Major T. D. Broughton, R.E.; *C.*—Lt.-Col. F. P. Connor: *W. E. E.*—Capt. W. E. Evans, R.A.M.C.; *L. H.*—Capt. L. Harrison; *H. D. P.*—Lt.-Col. H. D. Peile, I.M.S.

[The specimens taken by Col. Connor and Major Broughton are in the B. N. H. S. Museum. No map is published, because all the localities mentioned will be found on the maps which accompany Major R. E. Cheesman's paper on the Mammalia of Mesopotamia and Dr. P. A. Buxton's paper on the Birds of N. W. Persia]

PART I.

NOCTUIDÆ, LEMONIIDÆ AND PYRALIDÆ.

BY

LORD ROTHSCHILD, F.R.S.

I have been asked to contribute the portion dealing with the above 3 families to this list of Mesopotamian and Western Persian Lepidoptera. As in the other portions of the paper the captors' names are indicated by initials.

The nature of the lepidopterous fauna as indicated by the insects of the above 3 groups is decidedly Central Asian in character, though appertaining to the general desert fauna. As was to be expected, however, a few purely tropical forms are present. These are specially the 2 Noctuids *Erebus macrops*, Linn and *Hylodes caranea*, Guen. All the types except that of *Lemonia peilei* are in the Tring Museum.

NOCTUIDÆ.

Agrotinæ.

1. *Chloridea peltigera*, Schiff.

3, Mirjana, Dyala River, November, 1 Jebel Hamrin, June 1918, H. D. P.; 1 ♂, Amara, Mesopotamia, July 1916, B. T. : 1, Amara, May 1918, P. A. B.

2. *Chloridea nubigera*, Herr.—Sch.

1, Amara, Mesopotamia, November 1918, P. A. B.; 1, Mirjana, Dyala River, June 1918, H. D. P.

3. *Euxoa lata golickei*, Ersch.

1 ♂, Amara, Mesopotamia, November 1918, P. A. B.; 1 ♀, Mirjana, Dyala River, October 1918, H. D. P.

Sir George Hampson and many other writers have erroneously placed *lata*, Treits and *golickei*, Ersch, as varieties of *crassa*, Hbn., but the much longer and differently arranged pectinations of the antennæ of the two latter forms at once separate them from *crassa*. The 3 forms hitherto united under *crassa* must therefore stand as *Euxoa crassa*. Hbn.; *Euxoa lata lata*, Treibs. and *Euxoa lata golickei*, Ersch.

4. *Euxoa lasserrei*, Oberth.

1 ♂, Khaniqin, Mesopotamia, November 1918, P. A. B.

5. *Euxoa messaonda matritensis*, Vasq.

1 ♀, Baiji, River Tigris, November 1919, H. D. P.

6. *Euxoa segetum*, Schiff.

1 ♀, Mirjana, Mesopotamia, December 1918, H. D. P.

7. *Euxoa spinifera*, Hübn.

2 ♂♂, 1 ♀, Amara, Mesopotamia, May-August 1918, P. A. B.; 5—Amara, August 1916, B. T.; 1 ♀, Kut, April 1918, Br.

7*a*. *Euxoa cognita*, Shdgr.

1 ♀, Qazvin, September 1919, P. A. B.

7*b*. *Euxoa mustelina terminalis*, Subsp. nov.

♂ Distinguished from *m. mustelina* and *m. centralis* by the dark almost black subterminal area of the forewings.

Habitat.—Qazvin, September 1919, 1 ♂, P. A. B.

8. *Euxoa conspicua*, Hbn.

1 ♂, Enzeli, Caspian, N. W. Persia, June 1919, P. A. B.

9. *Agrotis ipsilon*, Hufn.

1, Amara, Mesopotamia, September 1916, B. T.; 1 ♂, Kut, May 1918, Br.

10. *Agrotis comes*, Hbn.

1 ♀, Enzeli, Caspian (Gilan), N. W. Persia, June 1919, P. A. B.

11. *Agrotis pronuba*, Linn.

3, Qizil Robat, Mesopotamia, March-April 1918, H. D. P.

12. *Lycophotia margaritosa*, Haw.

1 ♂, Resht, N. W. Persia, February 1919, P. A. B.

Hadeninæ.

13. *Discestra arenaria*, Hmpsn.

1 ♂, Amara, Mesopotamia, May 1918, P. A. B.

14. *Scotogramma tripolii*, Roth.

2. Amara, Mesopotamia, September 1916, B. T.

14*a*. *Scotogramma chimæra*, Rothock. 1 ♀, Baghdad, October 1917, P. A. B. (2nd known specimen.)

15. *Cardepia taylori*, sp. nov.

♂, similar to *irrisor*, Ersch., but larger and darker.

Antennæ brown; head and thorax greyish wood brown, *not* pale mouse grey abdomen wood grey, *not* buffish wood grey. Forewing dark brown grey, strongly variegated with blue-grey and cinnamon brown. Orbicular much larger than in *irrisor*, reniform more sharply defined and stained with black on lower portion, claviform very large and intense brown black; submarginal line much deeper dentate and angulate; fringe brown, not white, and with a row of large dark brown patches. Hindwing basal ½ less white, outer half sooty black; fringe white. Length of forewing 18mm. Expanse 41 mm. 1 ♂, Amara, Mesopotamia, October 1916, B. T.

16. *Sideridis vitellina*, Hübn.

1 ♀, Baku, Caspian, May 1919, P. A. B.

17. *Cirphis loreyi*, Dup.

1 ♂, 1 ♀, Amara, May-July 1918; 1 ♂, Kumait, River Tigris, November 1917, P. A. B.; Amara May-August 1916, B. T.; 2 ♀♀, Kut, May 1918, Br. and B. N. H. S.

18. *Cirphis zeæ indistincta*, Christ.

1 ♀, Basra, August; 1 ♂, Amara, October 1918, P. A. B.; 2, Amara, August 1916, B. T.

19. *Cirphis corrugata*, Hmpsn.

1 ♀, Amara, July 1918, P. A. B.; 1, Amara, July 1916, B. T.

Cucullianæ.

20. *Cucullia tanaceti*, Schiff. and Den.

1 ♀, Enzeli, Caspian, June 1919, P. A. B.

21. *Cleophana bœtica diluta*, Rothsch.

3 ♂, Mirjana, Dyala River, February 1919, H. D. P.

22. *Metopoceras omar caspica*, Alph.

1 ♂, Amara, April 1918, P. A. B.

Zenobiinæ (*Achronyctinæ*, Auct.)

23. *Cranioptora pontica*, Stdgr.
1 ♀, Qazvin 4,000 feet, July 1919, P. A. B.

24. *Prodenia litura*, Fabr.
2 ♂ ♂, Amara, November 1917 and June 1918; 1 ♂, Basra, August 1918, 1 ♀, Qurnah, May 1918, P. A. B.; 4, Basra, May-June ; 4, Amara, August 1916, B. T.

25. *Spodoptera abyssinia*, Guen.
1, Basra, May 16; Amara, June-September 1916. B. T.; 1 ♀ Basra, August 1918, P. A. B.

26. *Laphygma exigua*, Hübn.
1 ♂, 3 ♀ ♀, Amara, May-September ; 1 ♂, 2 ♀ ♀, Qurnah, May 1918, P. A. B.; 5, Amara, August 1916, B. T.

27. *Athetis clavipalpis*, Scop.
1 ♀ Kumait, November 1917, B. A. B.

28. *Athetis pertinax*, Stdgr.
1 ♂, Amara, April 1918, P. A. B.

29. *Catamecia buxtoni*, sp. nov.
♂ ♀ closely allied to *deceptrix*, Stdgr., but at once distinguished by the postmedian band of forewing being much less strongly and not so evenly curved, also this band is not so strongly nor so regularly dentate as in *deceptrix*. The black streak from the base of forewing is much stronger and more bent than in *deceptrix* and the reniform is larger and has on its basal side a large dark patch and a similar one is basal of the orbicular which patches are absent in *deceptrix* ; the subterminal band very sharp and angulated on and above vein 4. Hindwings white but not so pure as in *deceptrix* being irregularly tinged with grey.
Length of forewing: 19mm. Expanse: 42mm.
Habitat—2 ♂ ♂, 1 ♀, Ali ash Shargi, November 1917 (♂ Type), 1 ♂, 4 ♀ ♀, Kumait, November 1917, P. A. B.

30. *Catamecia minima bacheri*, Stdgr.
1 ♀, Amara, June 1918, P. A. B.

Erastrianæ.

31. *Eublemma parva*, Hübn.
1 ♂, 5 ♀ ♀, Amara, May—October 1918, P. A. B.

32. *Eublemma uniformis*, Stdgr.
3 ♀ ♀, 1 ♂, Qazvin, July 1919, P. A. B.

32*a*. *Erastria trabealis algira*, Oberth.
1, Amara, August 1916, B. T. (ab. *flavoniteus*, Aust.); 1 ♂, 6 ♀ ♀, Amara April-September 1918; 1, Qazvin, July 1919, P. A. B. (2 ab. *deleta*, Stdgr.)
Among the 5 *t. algira* there is only one quite typical, the remaining 4 are intermediate between *t. algira* and typical *trabealis* in the amount of black on the forewings.

33. *Tarache lucida lugens*, Alph.
1 ♂, 1 ♀, Menjil, N. W. Persia, March 1919, P. A. B.; 1 ♂, Baghdad, November 1917, L. H. (B. N. H. S.); 7, Kizil Robat, February-May; 1, Ba'ji, River Tigris, November 1919, H. D. P.

Westermanniinæ, Acoutnæii, Auct.

34. *Earias chlorophyllana*, Standgr.
2 ♀ ♀, Enzeli, Caspian, April 1919, P. A. B.

35. *Arcyophora dentula*, Led.
14, Amara, July-October 1916, B. T.

Catocalinæ.

35*a*. *Mormonia mesopotamica*, Kusn.
1, Karind, July 1, Kermanshah, August 1918, H. D. P.

36. *Mormonia neonympha*, Esp.
1, Basra, May 1916, B. T.; 1, Dyala River, June 1918; 4, Jebel Hamrin, June 1919, H. D. P.; 2 ♂ ♂, 1 ♀, Kut, May-June 1918, Br. (B. N. H. S.); 1 ♂, Qazvin, N. W. Persia, August 1919, P. A. B.

37. *Catocala elocata locata*, Stdgr.
1 ♂, Qazvin, N. W. Persia, July 1919, P. A. B.; 1, Jebel Hamrin, June 1918, H. D. P.; Kermanshah, August 1918, H. D. P.

38. *Catocala puerpera pallida*, Alph.
1 ♂, Kermanshah, September 1918, Br. (B. N. H. S.)

39. *Erebus macrops*, Linn.
1 ♀, Off coast of Persia, November 1917, Captain Simmonds.

40. *Homœa arefacta*, Swinh.
1 ♀, Amara, September 1918, P. A. B.; 20, Amara, July-October 1916, B. T.

41. *Parallelia algira*, Linn.
1, Basra, June, 7; Amara, August 1916, B. T.

42. *Grammodes geometrica*, Fabr.
1, Amara, October 1916, B. T.

43. *Chalciope hyppasia*, Cram.
4, Amara, August-October 1916, B. T.

44. *Leucanitis picta*, Christ.
1 ♀, Menjil, March 1919, P. A. B.

45. *Clytie arenosa*, Rothsch.
1 ♀, Amara, August 1916, B. T. ; 1 ♀, Kut, June 1918, Br. (B. N. H. S.).

46. *Pericyma albidentaria*, Frr.
1 ♂, Baghdad, October 1917, 2 ♂ ♂, Amara, June 1918 ; 1 ♀, Kut, August 1918, P. A. B. ; 3, Basra, June; 22, Amara, July-August 1916, B. T.

47. *Pericyma squalens*, Led.
3 ♀ ♀, Amara, April, June, July 1918, P. A. B.; 34, Amara, August 1916, B. T.

48. *Contyta profesta* (Christ.)
25, Amara, August 1916, B.T.; 1, Dyala River, June 1918, H. D. P.; 1, Kut, May 1918, Br. (B. N. H. S).; 2 ♂ ♂, 6 ♀ ♀, Amara, June-September; 2 ♂ ♂, 3 ♀ ♀, Kut, August 1918, P. A. B. ; 1, Jebel Hamrin, June 1919, H. D P.

Phylometrinæ (*Plusiinæ*, Auct.)

49. *Syngrapha circumflexa* (Linn.)
1, Mirjana, February ; 1, Kizil Robat, April 1919, H. D. P. ; 2 ♂ ♂, Amara, May 1918, P. A. B. ; 1 ♀, Kut, May 1918, Br. (B. N. H. S.).

50. *Phylometra ni*, Hübn.
1 ♂, Amara, May 1918, P. A. B.; 2, Amara, August 1916, B.-T. These specimens are very dark.

51. *Phylometra daubei*, Boisd.
1 ♂, Basra, August 1918, P. A. B.

52. *Phylometra chalcites*, Borkh.
1, Mirjana, February 1919, H. D. P. ; 2, Amara, August 1916, B. T.

53. *Phylometra gamma*, Linn.
8 Mirjana, January-February 1919, H. D. P.

Noctuinæ.

54. *Tarachephia hueberi*, Ersch.
2 ♀ ♀, Amara, May 1918, P. A. B.

55. *Hylodes caranea*, Guen.
1 ♀, Probably Karmanshah, Br. (B. N. H. S.)

56. *Pandesma anysa*, Guen.

3♂♂, Kut, May 1918 1, Br. (B. N. H. S.); 1♂, 1♀, Amara, May-June 1918; 1♂, Qazvin, August 1919, P. A. B.

56*a*. *Apopestes spectrum innotata*, Warr.

7, Kermanshah, August 1918 : 1, Kirkuk, September 1919. H. D. P.; 1 ♂, Qazvin, July 1919, P. A. B.

57. *Autophyla gracilis*, Stdgr.

1♀, Menjil, March 1919, P. A. B.

58. *Rivula sericealis*, Scop.

4♂♂, 3♀♀, Amara, October 1917-September 1918, P. A. B.; 1♀, Amara, September 1916, B.-T. This series is very variable.

Polypogoninæ (*Hypeninæ*, Auct.)

59. *Rhynchina eremialis*, Swinh.

1♂, 2♀♀, Amara, September-October 1918, P. A. B.; 1♂, Amara, September 1916, B.-T.

60. *Rhynchina ravalis syniocalis*, Stdgr.

3♂♂, 2♀♀, Amara, March-October 1918, P. A. B.; 2♀♀. Amara, August-October 1916, B.-T.

LEMONIIDÆ.

61. *Lemonia peilei*, sp. nov.

♂ Allied to *pia*, Püngl., but larger and the wings longer and narrower. Antennæ rufous chocolate; head, thorax, and abdomen dark testaceous buff. Forewing with apex strongly produced and pointed, costal edge deeply concave, costa and terminal edge bright yellowish buff, rest of wing pale cinnamon chocolate, a dark brown spot in cell ringed with buff, a submarginal band slightly convex and toothed basad primrose yellow. Hindwing cinnamon chocolate, a postmedian band, termen and fringe yellow.

Habitat—2♂, Mirjana, Dyala River, December 1918, H. D. P.

62. *Lemonia pia*, Püngl.

1♂, Qazvin. October 1919, P. A. B.

PYRALIDÆ.

Galleriinæ.

63. *Arenipses sabella*, Hmpsn.

2♂♂, 3♀♀, Amara, April-June 1918, P. A. B.; 1♀, August 1916, B.-T.

64. *Archigalleria buxtoni*, sp. nov.

♂, very much smaller than the ♀, forewings very short and at termen very square, giving the insect much the appearance of a *Hepialus*.

Antennæ grey brown; palpi, head and thorax pale grey mixed with mauve brown; abdomen dark brown grey.

Forewing pale grey powdered with brown scales; a partially broken black patch below median in basal $\frac{2}{3}$ths of wing, outer $\frac{1}{3}$ths of wing below subcostal area with strong cloud-like oil brown markings occupying almost the whole disc of the wing, a post discal whitish dentate band beyond which are black dots: a marginal line of black dots; a black brown patch followed by a white one with black brown spots in it below subcostal, fringe pale grey with chain of brown spots. Hindwing basal $\frac{1}{3}$ whitish passing gradually into the sooty black brown of remainder of wing, fringe greyish white.

♀. Antennæ greyish white annulated with brown; head, thorax and abdomen grey slightly sprinkled with brown. Forewing similar to ♂ but much paler and dark spots and markings smaller. Hindwing semivitreous white, with

brown grey terminal hairline. One specimen of the 5 has all light parts of forewings sandy buff as well as head, thorax and abdomen and 2 others have all these parts suffused with brown.

Length of forewing: ♂, 13 mm., ♀, 19 mm. Expanse: ♂, 29 mm., ♀ 42 mm.

Habitat—3 ♂ ♂, 5 ♀ ♀, Amara, June 1918, P. A. B.

65. *Lamoria anella*, Schiff.

2 ♂ ♂, Enzeli, May-June 1919, P. A. B.

Crambinæ.

66. *Ommatopteryx ramburella*, Dup.

5 ♂ ♂, 3 ♀ ♀, Amara, May 1917-June 1918; 1 ♀ Baghdad, September 1917; 1 ♀, Enzeli, June 1919, P. A. B.

67. *Ommatopteryx ocellea*, Haw.

1 ♂, 1 ♀, Amara, June 1918, P. A. B.

68. *Chilo phragmitellus*, Hübn.

1 ♂, Enzeli, June 1919, P. A. B.

69. *Chilo suppressalis*, Walk.

1 ♀, Amara, April 1918, P. A. B.

70. *Ancylolomia affinis*, sp. nov.

♂, Nearest to *palpella*, Schiff., but at once distinguishable by the entire absence of the silver bands on the median nervure and costo-subcostal area.

Palpi, head and thorox sandy buff; antennæ strongly pectinated, shaft white pectinatious brown black; abdomen whitish buff with broad brown bandlike markings, aval tuft white. Forewing sandy buff with intraneural brown bands which are dotted sparsely with minute black and silver dots; a broad silver streak from discocellulars to submarginal band which is brown and strongly dentate on both sides, wing from submarginal band to termen whitish with 2 brown lines, terminal line metallic. Hindwing pale brownish grey with darker terminal line; fringe white.

♀. Antennæ filiform brown; head and thorax pale buff; abdomen bush segment glistening white, rest pale buff. Forewing yellowish buff. Hindwing white.

Length of forewing: ♂ 20 mm., ♀ 24 mm.

Expanse: ♂, 43 mm., ♀, 52 mm.

Habitat—1 ♂, Amara, November 1917; 1 ♀, Qazvin, September 1919, P. A. B.

Siginæ (*Schœnobiinæ*, Auct.).

71. *Scirpophaga prælata*, Scop.

1 ♀, Enzeli, June 1919, P. A. B.

72. *Schœnobius incertellus*, Walk.

1 ♂, 5 ♀ ♀, Amara, June-July 1918; 1 ♀, Qurnah, May 1918, P. A. B.; 1 ♂, 1 ♀ =ab. *minutellus*, Zell; 2 ♀ ♀ =ab, *brunnesceus*, Moore.

I have not used the genus *Topentis* for *prælata* as Sir George Hampson has done because, although included in *Topentis* by Hübner; the genus *Topentis* was restricted by Stephens in 1829 as *Chilo*, Zincken and therefore *prælata*, Scop.=*phantasmella*, Hbn, is excluded, the 4 species Stephens restricts *Chilo*=*Topentis* to, not including it.

Hypsotropinæ (*Anerastiinæ*, Auct.).

73. *Raphimetopus ablutella*, Zell.

1 ♀, Baghdad, October 1917; 1 ♀, Qazvin, July 1919, P. A. B.

74. *Saluria maculivitella*, Rag.

1 ♂, Baghdad, October 1917: 1 ♂, 3 ♀ ♀, Amara, October 1917 and June 1918, P. A. B.

75. *Saluria pulverosa*, Hmpsn.

3 ♂ ♂, 2 ♀ ♀, Baghdad, October 1917: 2 ♀ ♀, Azizieh, October 1917; 1 ♂, 4 ♀ ♀, Amara, October 1917—May 1918, P. A. B.

Anerastiinæ (*Phycitinæ*, Auct.).

76. *Ephestia cautella*, Walk.
1 ♀, Basra, September 1918; 1 ♀, Amara, April 1918; 1 ♀, Enzeli, May 1919, P. A. B.

77. *Ephestia elutella*, Hübn.
1 ♀, Amara, April 1918, P. A. B.

77*a*. *Ephestia inductella*, Stdgr.
2 ♂ ♂, Enzeli, June 1919, P. A. B.

78. *Ephestia calidella*, Guen.
1 ♀, Baghdad, September 1917; 3 ♂ ♂, Amara, June-September 1918, P. A. B

79. *Spermotophora hornigii*, Led.
1 ♀, Basrah, September 1918; 1 ♀, Amara, September 1918; Baghdad, September 1917, P. A. B.; 1 ♀, Amara, September 1916, B. T.
Larva found in August feeding on windfall Dates.

80. *Heterographis hellenica*. Stdg.
3 ♂ ♂, 2 ♀ ♀, Amara, April-September 1918, P. A. B.

81. *Heterographis subcandidatella*, Rag.
7 ♂ ♂, 3 ♀ ♀, Amara, May-July 1918, P. A. B.

82. *Heterographis convexella*, Led.
1 ♀, Amara, June 1918, P. A. B.

83. *Heterographis fulvobasella*, Rag.
1 ♀, Amara, June 1918, P. A. B.

84. *Heterographis monostictella*, Rag.
1 ♂, Amara, September 1918, P. A. B.

85. *Heterographis microshictella*, Hmpsn.
1 ♀, Amara, June 1918, P. A. B.

86. *Heterographis pallida*, Stdgr.
1 ♂, 1 ♀, Qazvin, July-August 1919, P. A. B.

87. *Heterographis buxtoni*, sp. nov.
♀. Antennæ brownish cream; head, thorax and abdomen cream colour. Forewings cream colour. Hindwings silvery white.
Length of forewings: 10 mm. Expanse: 22 mm.
Habitat—1 ♀, Baghdad, October 1917, P. A. B.

87*a*. *Heterographis deserticola*, Stdgr.
1 ♂, Qazvin, September 1919, P. A. B.

88. *Psorosa nucleolella*, Mæschl.
1 ♂, 1 ♀, Amara, June-October 1918, P. A. B.

89. *Lasiosticha hieroglyphiella*, Rag.
1 ♂, Qazvin, July 1919; 1 ♂, Amara, June 1918, P. A. B.

90. *Aphyteles ochreella*, Rag.
2 ♀ ♀, Amara, September 1918; 1 ♂, September 1919, P. A. B.

90*a*. *Melanastia cerraticornella*, Zell.
1 ♀, Amara, September 1918, P. A. B.

91. *Salebria acervella*, Eusch.
1 ♀, Baghdad, September 1917, P. A. B.

91*a*. *Laodamia fusca postalbidior*, subsp. nov.
Differs from *f. infausta*, Rag., in the much whiter hindwings.
Habitat—1 ♂, 1 ♀, Amara, April 1918, P. A. B.

92. *Auxacia bilineela*, Rag.
4 ♂ ♂, 6 ♀ ♀, Amara, June-September 1918, P. A. B.

93. *Tlithyia semirubella*, Scop.
1 ♂. 1 ♀, Amara, April-September 1918; 1 ♀, Enzeli, June 1919, P. A. B.

94. *Tlithyia buxtoni*, sp. nov.

♀ Antennæ grey; head and thorax silvery slate grey ; abdomen slate grey. Forewing slate grey, an oblique antemedian white band and 2 subterminal white lines, disc between oblique band and basal subterminal line except on costa and in cell variegated with greyish white. Hindwing silvery grey, whiter towards base, fringe white.

Length of forewing ; 11 mm. Expanse : 24 mm.

Habitat—1 ♀, Menjil, March 1919, P. A. B.

95. *Zophodia suberastriella*, sp. nov.

♀ closely allied to *erastriella*, Rag., but much greyer, less rufous.

Differs principally in having the curved oblique black antemedian line stopping short in cell and the postmedian line more sinuate and more strongly angled.

Length of forewing : 9 mm. Expanse : 20 mm.

Habitat—Enzeli, Caspian, June 1919, 1 ♀, P. A. B.

95*a*. *Eurhodope buxtoni*, sp. nov.

♂ Nearest to *monogrammos*, Zell, but smaller and without metallic fringe and submarginal line. Uniform mouse grey ; fringe of forewing and marginal lines of both wings darker.

Habitat—1 ♂, Amara, June 1918, P. A. B.

Length of forewing : 8 mm. Expanse : 18 mm.

Pyralinæ.

96. *Bostra marginalis*, sp. nov.

♀ Antennæ black partially ringed with white ; head and thorax blackish purple brown, slightly sprinkled with clay colour ; abdomen purple brown, sprinkled with yellowish wood brown.

Forewing sooty brown black, a pale antemedian angled band, a row of pale spots along costa, a black stigmatic patch at end of cell, a sinuate strongly dentate greyish buff postmedian line, termino-subterminal area beyond this line yellowish wood grey with a smoky line and terminal row of black dots in it. Hindwings silky wood brown paler on basal half, an indistinct yellowish median band, fringe yellowish grey, terminal line brown.

Length of forewing : 10-13 mm. Expanse : 22-28 mm.

Habitat—Amara, 1 ♀, November 1918, P. A. B. ; 2 ♀ ♀, August-September 1916, B.-T. (Type).

97. *Dattinia argentalis*, Hmpsn.

6 ♀ ♀, Amara, September 1918, P. A. B.

98. *Dattinia canifusalis*, Hmpsn.

1 ♂, 1 ♀, Amara, May 1918, P. A. B. ; 1 ♂, Kizil Robat, March 1919, H. D. P.

99. *Dattinia simplicialis*, sp. nov.

♀ Antennæ, head, thorax and abdomen chalk white. Forewing chalk white, a patch running in from apex to end of cell, a spot at end of cell, terminal line, and outer $\frac{2}{3}$ of inner margin very pale buff. Hindwing silky white with pale buff terminal line.

Length of forewing : 12 mm. Expanse : 27 mm.

Habitat—Amara, June 1918, 1 ♀, P. A. B.

There is a ♀ of the species mixed up with *leonalis*, Oberth, in the British Museum from Elkantara, Algeria.

100. *Dattinia affinis*, sp. nov.

♀ Nearest to *poliopastalis*, Hmpsn., in pattern, but with shorter rounder wings more like *vulgaris*, Butl.

Differs from *poliopastalis* in lacking all blue-grey tints, in having a snow white not buff first abdominal segment, in the antemedian band of forewings being much broader and straight not angled in the white markings of forewings being much closer together, and in the quadrate brown terminal markings not row of terminal black spots.

Length of forewing : 10 mm. Expanse : 22 mm.
Habitat—Kut, August 1918, 1 ♀, P. A. B.

101. *Botys armenialis*, Led.

1 ♂, Azizieh, October 1917 ; 1 ♀, Baghdad, October 1917 ; 5 ♀ ♀, Amara September-October 1918, P. A. B.

Nymphulinæ.

102. *Nymphula nymphœata latifaseata*, subsp. nov.

♀ Differs from *n. nymphœata* in the bands of the hindwings being much broader, less irregular and less excised. The colour of the dark markings in this specimen is also much darker.
Habitat—Enzeli, June 1919, 1 ♀, P. A. B.
Staudinger already remarked that Syrian specimens were different.

103. *Nymphula nigrolinealis sordidior*, subsp. nov.

♂ Differs from *n. nigrolinealis*, Pryer, in the yellow being duller and the yellow marginal band on hindwings less even.
Habitat—Enzeli, June 1918, 1 ♂, P. A. B.

104. *Nymphula affinialis*, Gnen.

4 ♂ ♂, 7 ♀ ♀, Amara, April-June 1918, P. A. B.

Agroterinæ.

105. *Sylepta ruralis*, Scop.

1 ♂, 3 ♀ ♀, Enzeli, May-June 1919, P. A. B.

105*a*. *Ercta ornotalis*, Dup.

1 ♀, Amara, October 1917, P. A. B.

106. *Hellula undalis*, Fabr.

1 ♂, Enzeli, May 1919 ; 1 ♀, Qazvin, August 1919, P. A. B.

107. *Nomophila noctuella*, Schiff.

1 ♂, Enzeli, May 1219 . 1 ♂, Baghdad, October 1917 ; 1 ♀, Amara, April 1918, P. A. B. ; 1, Kizil Robat, February 1919 ; 1 Baiji, March 1920, H. D. P.

107*a*. *Psara pallidalis*, Hmpsn.

1 ♂, Enzeli, May 1919, P. A. B.

108. *Lonostege sulphuralis*, Hub.

1 ♂, Enzeli, June 1919, P. A. B.

109 *Loxostege palealis anaxisalis*, Walk.

1 ♂, Persian Talysh, July 1919, P. A. B.

110. *Loxostege sticticalis*, Linn.

1 ♂, 1 ♀, Persian Talysh, July 1919, P. A. B.

111. *Uresphiba polygonalis*, Hübn.

1 ♀, Amara, Septem' er, 1916, B.-T.

111*a*. *Cybolomia pentadalis*, Led.

2 ♂ ♂, Amara, June-September 1918, P. A. B.

112. *Metasia ochrifascialis*, Christ.

1 ♀, Kut, August 1918, P. A. B.

112*a*. *Metasia ossealis*, Stdgr.

2 ♀ ♀, Amara, June 1918, P. A. B.

113. *Pyrausta aurata*, Scop.

1 ♀, Enzeli, June 1919, P. A. B.

114. *Pyrausta cespitalis*, Schiff.

2 ♂ ♂, Amara, March-April 1918, P. A. B.

115. *Tegostoma baphialis*, Stdgr.

3 ♂ ♂, 2 ♀ ♀, Amara, April-September 1918 ; 1 ♀, Qazvin, July 1919, P. A., B.; 2 ♂ ♂, 1 ♀, Amara, July-August 1916, B.-T.

116. *Tegostoma paralis*, Hmpsn.

1 ♀, Baghdad, September 1917; 1 ♂, Qazvin, July 1919, P. A. B.

117. *Noctuelia floralis*, Hübn.

2 ♀ ♀, Amara, May-September 1918; 1 ♂, 2 ♀ ♀, Baghdad, September 1917; 1 ♀, Qazvin, July 1919, 1 ♀, Menjil, March 1919, P. A. B.

As the nomenclature employed may be strange to some of the readers of this journal I give below the 1st quotation of the name of each species :—

1. *Noctua peltigera*, Schiffermuller and Denis; *Aukünd. Syst. Werk. Schmett. Wier. Geg.*, p. 89, Class W. No. 1. (1775) (Vienna).

2. *Heliothis nubigera*, Herrich-Schiiffer, *Syst. Bearb. Schmett. Eur.*, Vol. II., p. 366 (1845) (Asia Minor).

3. *Agrotis golickei*, Erschoff, *Hor. Entom. Ross*, Vol. VIII., p. 316 (1871) (Turkestan).

4. *Luperina lasserrei*, Oberthur, *Etud. Entom. Fasc.* VI., p. 86, pl. 11, ff. 13, 14 (1881) (Magerta, Algeria).

5. *Heliophobus matritensis*, Vasquez, *Bol. Espan. Hist. Nat.*, 1905, p. 116, f. 1 (Madrid).

6. *Noctua segetum*, Schiffermuller and Denis, *Aukünd. Syst. Werk. Schmett Wier Geg.*, pp. 81, No. 12, 252, pl. 1, ff. 3a, b (1775) (Vienna).

7. *Noctua spinifera*, Hiibner, *Samm. Europ. Schmett.Noct.*, f. 389 (1808) (Europe).

7*a*. *Agrotis cognita*, Standinger, *Stett. Entom. Zeit.*, 1881, p. 417 (Ala Tau).

8. *Noctua conspicua*, Hiibner, *Samml. Europ. Schmett. Noct.*, ff. 718-719 (1830) (Europe).

9. *Phalaena, ipsilon*, Hufuagel, *Berl. Mag.*, Vol. III, p. 416, No. 99 (1766 (Berlin)=*Noctua suffusa*, Schiffermüller and Denis, *Aukünd Syst. Werk. Schmett. Wier. Geg.*, p. 80, No. 4 (1775) (Vienna.)=*Noctua Ypsilon*, Rottenburg, *Naturf.*, Vol. IX. p. 141 No. 99 (1776) (Berlin).

In Vol. 4 of the British Museum Catalogue of *Lepidoptera Phalænae* Sir George Hampson has used Rottenburg's name of *Ypsilon* for this insect. He did this on the assumption that the "Wiener Verzeichuiss" appeared in 1776 in which case the Vol. IX of the "Naturforscher" has some weeks priority; but the "Wiener Verzeichuiss" like so many of the older works was first put on the market in a few copies in 1775 under the title Ankundigungerves, &c., as an experiment, and when it was found successful, the remainder of the edition was issued in and dated 1776; therefore all names given in this work must date from 1775. Thus *suffusa*, Schiff, would, at first sight, appear to be the correct name by priority; but it is not so. Apparently Sir George Hampson has not thoroughly studied Rottenburg and Hufnagel's lists, but has relied too implicitly on Staudinger's "Catalogue." The fact is that Rottenburg's list is merely a critical survey of Hufnagel's work and in nearly every case Rottenburg's names published in 1776 must be quoted as being of Hufnagel, 1766, this latter author having 10 years priority.

10. *Noctua comes*, Hübner, *Samml. Europ. Schmett.*, f. 521 (1818) (Europe)= *Noctua comes*, Treitschke, *Schmett. Eur.*, Vol. V., part I., p. 254, No. 2 (1825) (Europe).

In Vol. 4 of the British Museum Catalogue Sir George Hampson gives priority to Treitschke (1825) as author of the name *comes* over Hübner. This he does because nearly all through his various lepidopterological books and articles, he has taken 1827 as the date both of Hübner's "Sammlung Europäischer Schmetterlinge" and of his "Verzeichniss bekannter Schmettlinge" whereas the date of the first part of the first edition of the "Sammlung" is 1796 and of the 2nd edition, 1805 and parts of the "Verzeichniss" appeared from 1816 to 1826.

11. *Phalæna pronuba*, Linnæus, *Syst. Nat.*, Edit. X., p. 512, No. 87 (1758) (Sweden).

12. *Noctua margaritosa*, Haworth, *Lepid. Brit.*, p. 18, No. 156 (1809) (Great Britain).

13. *Discestra arenaria*, Hampson, *Cat. Lepid. Phal. Brit. Mus.*, Vol. V., p. 16, No. 1139, pl. LXXVIII, f. 25 (1905) (Sind).

14. *Phalæna trifolii*, Hufnagel, *Berl. Mag.*, Vol. III., part IV., p. 398, No. 70 (1766) (Berlin)=*Noctua trifolii*, Rottenburg, Naturf, Vol. IX, p. 131, No. 70 (1776) (Berlin).

Here again Sir George Hampson in Vol. 5 of the British Museum Catalogue follows Staudinger and gives Rottenburg as author of the above name, whereas the 1st author and describer was Hufnagel.

14*a*. *Scotogramma chimaera*, Rothschild, *Novit. Zool.*, Vol.

16. *Noctua vitellina*, Hübner, *Samml. Europ. Schmett.*, ff. 379, 589 (1803) (Europe).

17. *Noctua loreyi*, Duponchel, *Hist. Nat. Lépid France.*, Vol. VII, part I, p. No. CCCCXXVIII (1827) (Province).

18. *Leucania indistincta*, Christoph, *Rom. Mém Lépid.*, Vol. III., p. 79, pl. 4, f. 5 (1887) (Kisil-Arwat).

19. *Leucania corrugata*, Hampson, *Faun. Brit. India Moths.*, Vol. II, p. 278, No. 1923 (1894) (Simla).

20. *Noctua tanaceti*, Schiffermüller and Denis, *Ankünd Syst. Werk. Schmett. Wier. Geg.*, p. 73, class T., No. 5 (1775) (Vienna).

21. *Cleophana boetica diluta*, Rothschild, *Ann. Mag. Nat. Hist.* (8) VIII., p. 232, No. 2 (1911) (Bon Saada).

22. *Metopoceras sacra var. caspica*, Alpheraky, *Tris.*, Vol. VIII, p. 171 (1895) (Tekke, Caspian).

23. *Acronycta pontica*, Staudinger, *Hor. Soc. Entom. Ross.*, Vol. XIV, p. 364 (1879) (Kerasdere).

24. *Noctua litura*, Fabricius, *Syst. Entom.* p. 601, No. 50 (1775) (I India Orientalis).

25. *Spodoptera abyssinia*, Guenèe, *Hist. Nat. Ins. Spec. Gen. Lépid.* Vol. V. *Noct.* I., p. 154, No. 244, (1852) (Abyssinia).

26. *Noctua exigna*, Hübner, *Samml. Europ. Schmett. Noct.*, f. 362 (1803) (Europe).

27. *Phalæna clavipalpis*, Scopoli, *Entom. Carn.*, p. 213, No. 526 (1763) (Carniolia).

28. *Caradrina pertinax*, Staudinger, *Hor. Soc. Entom Ross.*, Vol. XIV, p. 387 (1879) (Kerasdere).

30. *Catamecia jordana* var. *bacheri*, Staudinger, *Cat. Lépid. Palaar. Faunen*g Edit. III., Part I, p. 213, No. 2192*a*, 1901 (Dead Sea).

31. *Noctua parva*, Hübner, *Samml. Europ. Schmett.*, f. 356 (1803) (Europe).

32. *Thalpochares uniformis*, Staudinger, *Hor. Soc. Entom. Ross.*, Vol. XIV., p. 414 (1879) (Schahrud, Persia).

32*a*. *Agrophilas sulphuralis* var. *algira*, Oberthur, *Etud. Entom.*, Fasc. VI., p. 90 (1881) (Bône).

33. *Acontia lucida* var. *lugens*, Alpheraky, *Rom. Mem. Lépid.*, Vol. V., p. 182, No. 118 (1889) (Babatagh).

34. *Earias chlorophyllana*, Staudinger, *Tris*, Vol. IV., p. 249 (1891) (Mardin).

35. *Euxestes dentula*, Lederer, *Hor. Soc. Entom. Ross.*, Vol. VI., p. 89., pl. V., f. 8. (1870) (Astrabad).

35*a*. *Catocala mesopotamica*, Kusnezov, *Revue Russe Entom.*, p. 74, No. 2680. (1903) (Nomen novum).

36. *Noctua neonympha*, Esper, *Schmett.*, part IV., Vol. 2, p. 75, 251st sp., pl. CXCVIII., Noct, 49, f. 1, 2 (1796) (Sarepta.)

37. *Catocala elocata* var. *locata*, Staudinger, *Tris.*, Vol. IV., p. 327 (1891) (Taschkend, Margelan).

38. *Catocala puerpera* var. *pallida*, Alpheraky, *Mem. Lépid Roman.*, Vol. III., p. 406 (1887) (Lob-noor-Ak-Su).

39. *Phalæna macrops*, Linnæus, *Syst. Nat.*, Edit. XII, Vol. III., p. 225 (1768) (India Orientalis).

40. *Remigia arefacta*, Swinhœ, *Proc. Zool. Soc., Lond.*, 1884, p. 521, No. 63 (Karachi).

41. *Phalæna algira*, Linnæus, *Syst. Nat.*, Edit. XII, Vol. I., part II, p. 836, No. 98 (1767) (Algeria).

42. *Noctua geometrica*, Fabricius, *Syst. Entom.*, p. 599, No. 37 (1775) (India Orientalis).

43. *Phalæna hyppasia*, Cramer, *Pap. Exot.*, Vol. III, part XXI., p. 99, pl. CCL, f. E. (1779) (Coast of Coromandel).

44. *Leucanitis cailino* var. *picta*, Christoph, *Hor. Soc. Entom. Ross.*, Vol. XII., p. 257, No. 22, pl. 7, f. 28 (1877) (Krasnowodsk).

45. *Clytie arenosa*, Rothschild. *Novit. Zool.*, Vol. XX., p. 128, No. 69 (1913) (S. Oned Mya).

46. *Acidalia albidentaria*, Freyer, *Neu. Beitr. Schmetterlingsk.*, Vol. 4, part 59, p. 115, No. 597, pl. 354, f. 1 (1842) (S. Russia).

47. *Pericyma squalens*, Lederer, *Verh. Zool.-bot. Ver. Wien.*, Vol. V., p. 184, pl. 5, f. 11 (1855) (Cyprus).

48. *Pericyma profesta*, Christoph, *Entom. Zeit. Stett.*, Vol. 48, p. 165 (1887) (Askhabad).

49. *Phalæna circumflexa*, Linnæus, *Syst. Nat.*, Edit. XII, p. 844, No. 128 (1767) (Europe).

50. *Noctua ni*, Hübner, *Samml. Europ. Schmett. Noct.*. f. 284 (1802) (Europe).

51. *Plusia daubei*, Boisduval, *Gen. et. Ind. Meth. Europ. Lepid.*, p. 159, No. 1281 (1840) (Spain, Andalusia).

52. *Noctua chalcites*, Esper, *Schmett.*, Vol. I., part IV, pl. CXLI, Noct. 62, f. 3 (ante 1792); Borhausen, *Syst. Beschr. Europ. Schmett.* (Naturg. Europ. Schmett.) part 4, p. 774, No. 352 (1792) ; Esper, Vol. I., part IV., p. 447, spec. 167 (1796-1805) (Central Italy).

53. *Phalæna gamma*, Linnæus, *Syst. Nat.*, Edit. X., p. 513, No. 91 (1758) (Sweden).

54. *Acontia hueberi*, Erschoff, in *Fedtschenko Voyage au Turkestan Lepid*, p. 49, pl. III., f. 47 (1874) (Desert of Kisil-Kum).

55. *Hulodes caranea*, Guenèe, *Hist. Nat. Ins. Spec. Gen. Lepid.*, Vol. VII., Noct. III., p. 208, No. 1608 (1852) (Yova, Sylhet, &c.).

56. *Pandesma eanysa*, Guenèe, *Hist. Nat. Ins. Spec. Gen. Lepid.*, Vol. VI., Noct. II., p. 439, No. 1311 (1852) (Central India).

56*a*. *Apopestes spectrum innotata*, Warren, in *Seitz Grossschmett. Erde.*, Vol. 3, p. 370, pl. 68b (1913) (Amaria, Syria).

57. *Spintherops gracilis*, Standinger, *Entom. Zeit. Stett.*, Vol. 35, p. 95 (1874) (Krasnosowodsk).

58. *Phalæna sericealis*, Scopoli, *Entom. Carn.*, p. 242, No. 615 (1763) (Carniolia).

59. *Rhychina eremialis*, Swinhoe, *Proc. Zool. Soc., Lond.*, 1889, p. 417 (Hydrabad).

60. *Hypena ravalis*, var. *syriacalis*, Staudinger, *Tris.* Vol. IV., p. 335 (1891) (Syria).

62. *Lemonia pia*, Püngler, *Tris.*, Vol. XV., p. 143, No. 2, pl. 6, f. 17 (1902) (Dead Sea).

63. *Arenipses sabella*, Hampson, in *Mem. Lepid. Roman.* Vol. VIII., p. 501, No. 93, pl. XXIV., fig. 1 (1901) (Fao).

65. *Tinea anella*, Schiffermüller and Denis, *Aukünd Syst. Werk. Schmett. Wier. Geg.*, p. 135, No. 30 (1775) (Vienna).

66. *Crambus ramburiellus*, Dupouchel, *Hist. Nat. Lepid. France*, Vol. 10, Coutin, Vol. VII, p. 83, No. MCCCLXXXII., pl. 270, f. 8. (1836) (Ajaccio).

67. *Palparia ocellea*, Haworth, *Lepid. Brit.*, Part III, p. 486, No. 21 (1811) (London).

(68. *Tinea phragmitella*, Hübner, *Samml. Europ. Schmett.*, ff. 297-298 (1811) (Europe).

69. *Crambus suppressalis*, Walker, *List Spec. Lepid. Ins. Brit. Mus.*, part XXVII., p. 166, No. 108 (1863) (Shanghai).

71. *Phalæna prælata*, Scopoli, *Entom. Carn.*, p. 198, No. 494 (1763) (Carnialia).

72. *Chila incertulas*, Walker, *List Spec. Lepid. Ins. Brit. Mus.*, part XXVII, p. 143, No. 15 (1863) (Sarawak).

73. *Anerastia ablutella*, Zeller, *Tris.* 1839, part III, col. 177, No. 4 (Sicily).

74. *Saluria maculivittella*, Ragonot, *Ann. Soc. Entom. France.*, Vol. LVI. (Ser. 6, Vol. 7), p. 258, No. 181 (1887) (Gabes ; Mt. Elder ; Marghilan).

75. *Poujadia pulverosa*, Hampson, *Faun. Brit. Ind. Moths.*, Vol. IV., p. 60, p. 73, No. 27 (1863) (Ceylon).

76. *Pempelia cautella*, Walker, *List Spec. Lepid. Ins. Brit. Mus.*, part XXVII, p. No. 4302 (1896) (Sind).

77. *Tinea elutella*, Hübner, *Samml. Europ. Schmett*, f. 163 (1796) (Europe).

77*a*. *Ephestia inductella*, Staudinger, *Hor. Soc. Entom. Ross.*, Vol. XV., p. 229 (1880) (Amasia).

78. *Ephestia calidella*, Guenèe, *Europ. Microl. Ind. Meth.*, p. 82 (1845) (Islands of Hyères).

79. *Spermatophora hornigii*, Lederer, *Verh. Zool. Bot. Ver. Wien.*, Vol. II., p. 133 (1852) (Vienna).

80. *Myelois rhodochrella* var. *hellenica*, Staudinger, *Hor. Soc. Entom. Ross.*, Vol. VII., p. 209, No. 597, pl. II, f. 18 (1871) (Africa).

81. *Heterographis subcandidatella*, Ragonot, *Ann. Soc. Entom. France.*, Vol. LVI. (Ser. 6, Vol. 7), p. 249, No. 126 (1887) (Marghilan).

82. *Myelois convexella*. Lederer, *Verh. Zool. Bot. Ver. Wien.*, Vol. V., p. 222, pl. 4, f. 9 (1855) (Beirut).

83. *Heterographis fulvobasella*, Ragonot, *Ann. Soc. Entom. France.*, Vol. LVI., (Ser. 6, Vol. 7), p. 248, No. 123 (1887) (Shatrud).

84. *Heterographis monostictella*, Ragonot, *Ann. Soc. Entom. France.*, Vol. LVI. (Ser. 6, Vol. 7), p. 249, No. 127 (1887) (Derbent).

85. *Heterographis microstictella*, Hampson, *Journ. Bomb. Nat. Hist. Soc.*, Vol. XV., p. 23 (1903).

86. *Myelois pallida*, Staudinger, *Berl. Entom. Zeitschr.*, Vol. 14, p. 202, No. 40 (1870) (Sarepta).

87*a*. *Myelois deserticola*, Staudinger, *Berl. Entom. Zeitschr.*, Vol. 14, p. 201, No. 39 (1870) (Sarepta).

88. *Nephopteryx nucleolella*, Möschler, *Berl. Entom. Zeitschr.*, Vol. 10, p. 147 (1866) (Sarepta).

89. *Pempelia hieroglyphiella*, Ragonot, *Ann. Soc. Entom. France.* Vol. LVI. (Ser. 6, Vol. 7), p. 244, No. 95 (1887) (Astrabad).

90. *Tephris ochreella*, Ragonot, in *Mèm. Lépid. Roman.*, Vol. VII., p. 448, pl. XIII., f. 13 (1893) (Shahrud).

90*a*. *Nephopteryx serraticornella*, Zeller. *Tris.*, 1839, part III, col. 179 (1839) (S. Europe).

91. *Alispa acervella*, Erschoff in Fedtschenko, *Voy. au Turk.*, p. 90, No. 309, pl. V., f. 94 (1874) (Kisil-Kum).

92. *Aria bilineella*, Ragonot, *Ann. Soc. Entom. France*, Vol. LVI. (Ser. 6, Vol. 7), p. 235, No. 50 (1887) (Turkistan).

93. *Phalæna semirubella*, Scopoli, *Entom. Carn.*, p. 245. No. 623 (1763) (Carniolia).

97. *Constantia argentalis*, Hampson. *Trans. Entom. Soc.. Lond.*, 1900. p. 380, No. 6a (Syria).

98. *Constantia canifusalis*, Hampson, *Trans. Entom. Soc.. Lond.*, 1900, p. 381. No. 7b, pl. 111, f. 16 (Algeria, &c.).

101. *Cledeobia armenialis*, Lederer, *Ann. Soc. Entom. Belg.*, Vol. 13, p. 51, No. 14, pl. 11, ff. 7, 8 (1869-1870) (Transcaucasia).

104. *Nymphula affinialis*, Guenèe, *Hist. Nat. Ins. Spec. Gèn. Lèpid.*, Vol. VIII., p. 270, No. 259 (1854) (Central India).

105. *Phalœna ruralis*, Scopoli, *Entom. Carn.*, p. 242, No. 616 (1763) (Carniolia).

105*a*. *Asopia ornatalis*, Duponchel, *Hist. Nat. Lèpid. France*, Vol. VIII., pt. II., p. 207, No. MXXX., pl. 223, f. 8 (1831) (France).

106. *Phalœna undalis*, Fabricius, *Entom. Syst.*, Vol. III., part II., p. 226, No. 362 (1794) (Italy).

107. *Tinea noctuella*, Schiffermüller and Denis, *Ankünd. Syst. Werk. Schmett. Wier. Geg.*, p. 136, No. 35 (1775) (Vienna).

107*a*. *Pachyzanclapallidalis*, Hampson, *Ann. Mag. Nat. Hist.* (8) XI., p. 513, No. 18c (1913) (Tenimber).

108. *Pyralis sulphuralis*, Hübner, *Samml. Europ Schmett.*. ff. 166, 167 (1818) (Europe).

109. *Botys anaxisalis*, Walker, *List. Lepid. Ins. Brit. Mus.*, Part XVIII., p. 658, No. 194 (1859) (Shanghai).

110. *Phalœna sticticalis*, Linnæus, *Fauna Suecica*, Edit. II., p. 352, No. 1354 (1761) (Sweden).

111. *Pyralis polygovalis*, Hübner, *Samml. Auserl. Vög. and Schmett*, p. 76, (1793).

111*a*. *Botys pentadalis*, Lederer, *Verh. Zool. Bot. Ver. Wien.*, Vol. V., p. 217 (1855) (Beirut).

112. *Metasia ochrifascialis*, Christoph, *Hor. Soc. Entom. Ross.*, Vol. XVII, p. 121, No. 11 (1883) (Ordubat).

112*a*. *Metasia ossealis*, Staudinger, *Hor. Soc. Entom. Ross.*, Vol. XV., p. 182 (1880) (Asia Minor).

113. *Phalœna aurata*, Scopoli, *Entom. Carn.*, p. 227, No. 565 (1763) (Carniolia).

114. *Pyralis cespitalis*, Schiffermüller and Denis, *Ankünd, Syst. Werk. Schmett. Wier. Geg.*, p. 123, No. 32 (1775) (Vienna).

115. *Anthophilodes baphialis*, Staudinger, *Hor. Soc. Entom Ross.*, Vol. VII., p. 183, No. 503, pl. II., f. 7 (1870) (Astrochan).

116. *Tegostoma paralis*, Hampson, *Trans. Entom. Soc., Lond.*, 1900, p. 399, No. 3a (Namangan).

117. *Pyralis floralis*, Hübner, *Samml. Europ. Schmett.*, f. 142 (1800) (Europe).

The numbers left out of the list of first quotations are those of species and sub-species described as new in the body of the paper.

I have enumerated 133 species and sub-species in my section consisting of 64 *Noctuidæ*, 2 *Lemoniidæ* and 67 *Pyralidæ*. There are 4 *Noctuidæ*, 1 *Lemoniidæ* and 11 *Pyralidæ* described here for the first time, making 16 new species and sub-species.

MOTHS OF MESOPOTAMIA AND N. W. PERSIA.

Part II.

SPHINGES & BOMBYCES

BY

H. T. G. Watkins

AND

P. A. Buxton, M.A., F.E.S., Fellow of Trinity College, Cambridge.

General remarks on the affinities of the Mesopotamian fauna would be out of place in a short paper devoted to systematics. One new species and one new sub-species are described below :

Sphingidæ.

1. *Acherontia styx*, Westw.

One, July, one. August 1916, Amara, B.-T.; one, Baghdad, 10th October 1917. P. A. B. ; one, 30th May 1917, Amara, B. N. H. S. Closely allied to *A. atropos*, of Europe.

2. *Herse convolvuli*, L.

One 15th May 1918, Baghdad—" 11-30 p.m. at light. Insect settled on plaster wall. Large wall lizard advanced towards it from in front, halting about 8 inches away. Lizard attacked, biting insect on left fore wing, costa near thorax, injuring this region. Insect escaped after struggle, fell to ground and was secured.

N.B.—Sphingid moths seem very liable to attack by wall lizards, as I have witnessed this also in *C. lineata* and *T. alecto*. Owing to their size they also made their escape in the encounters mentioned," W. E. Waller.

3. *Deilephila nerii*, L.

One, Amara, 20th November 1916, C ; one, 16th November 1918, Basra, C. ; one, 30th April 1919, bred from Basra larva, B. N. H. S. ; one, 30th March 1919, Beit Na'ama, " one caught, several seen," W. E. E.

4. *Celerio lineata*, Fab., subsp. *livornica*, Esp.

One, Amara, 7th May 1918, P. A. B. ; one, May 1918, Kut ; Qizil Robat, 14th March to 10th April 1919, " the moth fairly common by day at a white-flowered scabious ; larva found on small plantain, pupated April 21st, emerged 11th May " ; moth at light 15th May, H. D. P.

5. *Celerio nicœa*, de Prunner.

One, Kermanshah, 1918, Br. This specimen is of the typical European race and not of the subspecies *lathyrus*, Wlk., of which the type from N. India is in the British Museum. A coloured sketch of the showy larva, and a full description of it was sent home by Col. Peile. This larva was found on a rock high up at Harir, N. W. Persia, 12th September 1918 ; the food-plant is spurge (*Euphorbia*).

6. *Hippotion celerio*, L.

Two, Beit Na'ama, Basra, 26th March and 1st April 1919, at light, W. E. E.

7. *Theretra alecto* subsp. *cretica*, Boisd.

We have seen specimens collected in every month from March to September, at Basra, Amara and Baghdad. Buxton found pupæ at Amara, one on the ground under a log, and another under the bark of a *Zizyphus* tree four feet from the ground ; both were completely without any cocoon or earthen cell.

8. *Pergesa elpenor*, L.

One 27th June 1919, Enzeli, Caspian Sea, P. A. B. This specimen is of the typical European form.

9. *Laothoe kindermanni*, Lederer.

One, ♀, Ararat, Kurdistan, C. This specimen is of the typica race. Two (1 ♂, 1 ♀,) 16th November 1918, Basra, C., are subsp, *orbata*, Gr. which is lighter and more uniformly marked. The species is allied to *L. ocellatus* of Europe.

10. *Macroglossa stellatarum*, L.

We have examined a number of specimens collected in September, October and November at Basra, Amara, Baghdad, Mirjana, Khaniqin, Kirkuk, and Kermanshah and two collected in April at Beit Na'ama, near Basra, W. E. E. " one, 18th November 1918, Mirjana, near Qizil Robat ; often comes into tents seeking hybernation ; ibid, 27th January 1919," H. D. P.

Hypsidæ.

11. *Callimorpha quadripunctaria*, Poda (=*hera*, L).

13th July to 19th August 1918, Harir and Karind, W. Persia. " In large numbers settled on leaves of trees a few feet from the ground, easy to catch ; August 10, abundant still but more females ; 19th August nearly over," H. D. P.

Arctiidæ.

12. *Utetheisa pulchella*, L.

We have seen a large series collected in every month between 2nd May and 1st November from Nasiriyeh, Amara, Baghdad, Mirjana near Qizil Robat, Jebel Hamrin on the River Diyala, Kut, Kirkuk, and Assur. The moth is continuously on the wing throughout this period, and Buxton took two specimens freshly emerged at Amara on 23rd October. Peile found larvæ in dozens at Mirjana from December to February.

13. *Ocnogyna lœwii*, Zell.

Five males taken at light between 11th December 1918 and 7th January 1919 at Mirjana, H. D. P.: Like a small pale *Arctia ;* the ♀ has rudimentary wings.

14. *Pelosia muscerda*, Hufn.

One, 31st May 1919, Enzeli, Caspian Sea, P. A. B.

15. *Pelosia uniformis*, sp. nov.

Lord Rothschild has been good enough to give us this description for insertion " Female uniform wood-brown. Forewing with three obsolete darker dots on veins 3, 4 and 7 respectively. Hindwings slightly paler. Length of forewing 10 mm. Expanse 23 mm. 1 ♀, Enzeli, Caspian Sea, 1st June 1919, P. A. Buxton." The type is in the Tring Museum.

Lasiocampidæ.

16. *Lasiocampa grandis*, Rogenh. (=*salomonis*, Stgr.)

One male, 30 May 1917, Amara, C. This specimen agrees with the description and figure in Seitz's *Macrolepidoptera* of the world. *L. grandis* is already known from Palestine, and there appears very little doubt that this specimen belongs to that species, but we have been unable to compare it with actual specimens.

17. *Lasiocampa terreni*, H. Sch.

One male, 23rd October 1919, Mosul, H.D.P. This specimen appears to be referable to the above species but is more silvery over the whole upper surface except the fringes, than the only specimen in the British Museum, a male from Transcaucasia.

18. *Chilena proxima*, Stgr.

One male " probably from Kut ", B. N. H. S. ; one male, 12 May 1918. Baghdad, at light. (W. E. Waller).

19. *Taragama siva*, Lef.

First brood : male bred 27th April 1918 Amara, W. E. E. ; female. 28th April 1918, Amara, at light, P. A. B. Second brood : male, 27th September 1916, Amara, B. T ; male on poplar tree, 4th October 1918, W. E. E.; 1 ♂, 1 ♀, 16th November 1918, Basra, C. The larva feeds on the common shrub (*Prosopis*)

which is generally called acacia ; and its colour makes it exceedingly difficult of detection even when a number of larvæ are resting on a bush which they have rendered almost leafless ; the general colour of the larva is a warm purplish brown, and it flattens itself over the surface of the stem in the manner of its relative the Lappet Moth (*Gastropacha*) in Great Britain.

Lymantriidæ (*Liparidæ*).

20. *Lymantria dispar*, L.
2 ♂, 13th July 1918, Harir, W. Persia, H. D. P.
21. *Ocnerogyia amanda*, Stgr.
3 ♂, 1 ♀, 28th July 1918, Ba'qubah, River Diyala, P. A. B. This moth though almost unknown in collections is a serious pest of figs in Mesopotamia ; it completely defoliates the trees, and has been received from various parts of the Diyala basin and from Kerbela ; it was originally described from Mardin in the extreme north of Mesopotamia. Notes on its ravages, life history and structure have been published by one of us in Bull. Ent. Res. XI. p. 181—186. (1920).
22. *Ocneria signatoria*, Christoph, subsp. *pœnitens*, Stgr.
1 ♀, Baghdad, 9th October. 11 ♀, Aziziyeh, River Tigris, 14th October 1917, at light, P. A. B.
23. *Arctornis* (*Porthesia*) *chrysorrhœa*, L.
One female, 29th June 1919, Enzeli, P. A. B.

Notodontidæ (*Ceruridæ*).

24. *Dicranura vinula*, L., subsp. *intermedia*, Teich.
1 ♀, Ararat, Kurdistan, C ; 1 ♀, 24th September 1918, Qalat Saleh, River Tigris, P. A. B. In the British Museum there is a female from Quetta, and a male from Fao, very like these specimens, but there are no specimens from Syria. This form is possibly a species distinct from *D. vinula*.

Zygænidæ.

25. *Zygæna dorycnii*, O.
Half a dozen specimens of both sexes from Tula Rud, Persian Talish, 3-8th July 1919. The species was fairly common flying over grass and settling on flowers of chicory, close to the shore of the Caspian, P. A. B.
26. *Procris solana*, Stgr.
1 ♂, 30th March 1919, Menjil, valley of Sufed Rud, N. W. Persia, alt. 2,000 ft. (P. A. B.)
27. *Procris micane*, Frr.
1 ♂, 28th March 1919, Menjil. P. A. B. It is curious that the only two " foresters " taken at the same time and place represent quite different species ; these were the only ones seen though a special effort was made to find more.

Cossidæ.

28. *Cossus araraticus*, Teich.
1 ♂, 29th May 1919, Enzeli, P. A. B.
29. *Holcocerus gloriosus*, Stgr., subsp., *mesopotamicus*, n. subsp.
2 ♂, 3 ♀, 28th June 1918, Kut; Br. 5 ♀, 30th May to 28th June 1918, Amara, P. A. B. It appears that the Mesopotamian race of this insect is undescribed, and as we have been able to compare the above specimens with 9 specimens from Bokhara, the terra typica, we feel justified in describing the race as new : it differs from the typical form in that all the spots on the forewing are enlarged into blotches, with the exception of the spots at the base of the fringe. The type is a female collected at Kut by Major Broughton, and has been presented to the British Museum by the B. N. H. S.

MOTHS OF MESOPOTAMIA AND N. W. PERSIA.

Part III.

GEOMETRIDÆ.

By

Louis B. Prout.

Subfamily—*Hemitheinæ.*

1. Chlorissa pulmentaria, Guen.

Nemoria pulmentaria, Guen, Spec. Gen. Lep., IX., 349 (1858).

"Mesopotamia", without more exact data, 1 ♀, very rubbed, apparently referable to this species (Br.)

Staudinger records *C. pulmentaria* from Syria, Asia Minor, Armenia and N. Persia, as well as a great part of Europe and Central Asia, but as the closely allied Indian species *solidaria*, Guen., extends to Fao on the Persian Gulf, it is possible that some of his records, together with the present one, are really referable to *solidaria*.

2. Microloxia polemia, Prout.

Microloxia polemia, Prout, Nov. Zool, XXVII, 300 (1920).

Kut al Amara, 3 ♀ ♀, 7-9th August 1918 (P. A. B.)

The description of this interesting new species, as also that of *Lithostege buxtoni*, appeared in 1920. The types are in my collection. No. 1 of the "Novitates." Rather broader-winged than *halimaria*, Chret., the markings sometimes rather suggestive of *Xenochlorodes beryllaria*, Mann, the hindwing even more fully rounded.

Subfamily—*Sterrhinæ.*

3. Scopula ornata, Scop.

Phalæna ornata, Scop., Ent. Carn., 219 (1763).

Enzeli, N. W. Persia, 2 ♂ ♂, 1st May and 30th June 1919 (P. A. B.)

The earlier specimen is worn, the later probably represents a second brood. The species has not hitherto been recorded from Persia and the form may prove racially differentiable.

4. Scopula nigropunctata, Hufn.

Phalæna nigropunctata, Hufn., Berl. Mag., IV., 526 (1767).
Acidalia strigilaria, Stgr. and Rbl., Cat. Lep. Pal. (i), 275 (1901).

Enzeli, N. W. Persia, sea level, 2 ♀ ♀, 6th and 30th June 1919 (P. A. B.)

5. Scopula ochroleucata, H.-Sch.

(*Acidalia*) *ochroleucata*, H.-Sch., Syst. Bearb. Schmett. Eur., III. t. 3, f. 21-23 1844).
Acidalia ochroleucaria, H.-Sch., tom. cit. p. 24 (1847).

Baghdad, 2 ♂ ♂, 22nd September; 1 ♂, 25th September; 1 ♂, 7th October 1917 (P. A. B.)

Amara, 1 ♂, 2nd November 1918; 5 ♀ ♀, 2nd April, 15th June, 22nd June, 28th October, 19th November 1918 (P. A. B.)

Qazvin, N. W. Persia, 1 ♂, 17th July 1919 (P. A. B.)

Variable as usual, the Amara ♀, dated 2nd April, much larger than the rest. At Baghdad the species was common in melon patches.

Staudinger only records *ochroleucata* under its own name from the Canaries and a few Mediterranean countries, referring to most of the N. African and Asiatic localities under "*remotata*, Guen. (præc. sp. forma Darw. ?)" It is certainly all one and is doubtfully distinct, even racially, from *minorata*, Bdv. (S. Africa, Madagascar, Mauritius, etc.)

6. Sterrha Politata, Hb.

Phalæna Geometra politata, Hb., Vög. u. Schmett. p. 5, f. 1 (1793).

Enzeli, sea level, 2 ♂ ♂, 28th May, 1 ♂, 8th June, 1 ♀, 29th June 1919 (P. A. B.)
All are referable to the form *abmarginata*, Bhtsch., which seems racially constant in some places (*e.g.*, Hungary), while in others it occurs with the name-type. I am not sure, however, that these Persian specimens may not form a separable race from the European—slightly less glossy, more tinged with straw-colour, costal markings rather weak, subterminal line broad (in the sole ♀ almost reaching the distal margin), underside rather sharply marked.

7. Sterrha elongaria, Rbr.

Dosithoea elongaria, Rbr., Ann. Soc. Ent. Fr., II, 38 (1833).

Kut al Amara, 2 ♀ ♀, 9th August 1918 (P. A. B.)
Obscurely marked specimens with a strong sandy tone of colour, somewhat doubtfully referred to this widely distributed and variable species, which perhaps still comprises more than one not yet satisfactorily differentiated.

Subfamily—*Larentiinæ*.

8. Rhodometra sacraria, Linn.

Phalæna Geometra sacraria, Linn., Syst. Nat. (ed. 12) I (2) 863 (1767).

Baghdad, 3 ♂ ♂, 1 ♀, 23rd September 1917 (P. A. B.)

Amara, River Tigris, 4 ♀ ♀, 11th May, 14th June, 16th June and 20th June 1918, P. A. B.

Shahroban, Dyala River (close to Persian border) 1 ♂, 30th July 1918 (P. A. B.).
Kut al Amara, 1 ♂, 9th August 1918 (P. A. B.)
Not very variable, all referable broadly to the name-typical form. On an average small, especially the Baghdad specimens.

9. Lythria purpuraria, Linn.

Phalæna Geometra purpuraria, Linn., Syst. Nat. (ed. 10) I, 522 (1758).

Qazvin, N. W. Persia, 4,000 feet, 1 ♂, 30th July 1919 (P. A. B.)
Belongs to the form *lutearia*, Vill., which seems prevalent in the summer generation in eastern localities. New for Persia (?).

10. Lithostege buxtoni, Prout.

Lithostege buxtoni, Prout, Nov. Zool., XXVII, 312 (1920).

Kangavar, Hamadan, N. W. Persia, 5,000 feet, 1 ♂, 6th December 1918 (P.A. B.), the type of the species.

Shergat (Asshur), Mesopotamia, 1 ♂, 27th December 1919, at light (H. D. P.)
A very interesting new species, forming (together, perhaps, with "*Anisopteryx*" *chaoticaria*, Alph., which is unknown to me) a new section of the genus, characterized by the long ciliation of the ♂ antenna. Apparently variable, the second specimen darker than the type, with the longitudinal curved white stripe of the forewing more sharply expressed.

11. Lithostege farinata, Hufn.

Phalæna farinata, Hufn., Berl. Mag. IV, 610 (1767).

Mirjana, near Kizil Robat, Dyala River, 1 ♂, 20th February 1919, flying by day (H. D. P.)

Kizil Robat, 1 ♂, 1 ♀, 23rd and 28th February 1919 (H. D. P.)

Apparently new for Mesopotamia, though recorded from Palestine and Armenia.

12. Orthonama obstipata, Fab.

Phalæna obstipata, Fab., Ent. Syst. III (2), 199 (1794).
Larentia fluviata Stgr. and Rbl., Cat. Lep. Pal. (i), 298 (1901).

Amara, River Tigris, 1 ♂ (small), 15th June 1918, 2 ♀ ♀, 1st May and 2nd November, 1918 (P. A. B.)

Enzeli, N. W. Persia, 1 ♂, 1 ♀, (small), 28th May 1919.

A migrant, found nearly throughout Europe and Continental Asia, besides a great part of America.

13. Cœnotephria alfacariata, Rbr.

[ ] *alfacariata*, Rbr., Cat. Syst. Lep. Andal. (2) t. 18, f. 1 (1866).

Cidaria ibericata, Stgr., Cat. Lep. Eur. (ed. 2) 187 (1871).

Menjil, N. W. Persia, 2,000 feet, 1 ♂, 30th March 1919, at light (P. A. B.)

Darker and more strongly marked, with a stronger cell-spot, than our western forms, but I think referable here. Not hitherto recorded from further east than Palestine. The similar *reclamata* Püng. is more elongate-winged, with the hindwing whiter.

14. Euphyia polygrammata, Bkh.

Phalæna Geometra polygrammata, Bkh., Naturg. Eur. Schmett, V, 560 (1794).

Enzeli, N. W. Persia, sea level, 2 ♀ ♀, 14th and 20th June 1919 (P. A. B.).

New for Persia, though known from Asia Minor and Turkestan.

15. Eupithecia centaureata, Schiff.

Geometra centaureata, Schiff., Schmett. Wien. 114 (1775).
Tephroclystia oblongata, Stgr. and Rbl., Cat. Lep. Pal. (i), 308 (1901).

Enzeli, N. W. Persia, sea level, 1 ♀, 26th May 1919 (P. A. B.).

Already known from Syria, Armenia, Transcaspia, etc.

16. Eupithecia ultimaria, Bdv.

Eupithecia ultimaria, Bdv., Gen. et Ind. Meth., 210 (1840).

Amara, River Tigris, 1 ♂, 3rd April 1918, 1 ♀ at light, 15th June 1918 (P. A. B.).

New for Mesopotamia. Both examples have the underside very sharply marked and are probably referable to the form *opisthographata*, Dietze (Iris, xix., 66).

17. Gymnoscelis pumilata, Hb.

Geometra pumilata, Hb., Samml. Eur. Schmett. IV., t. 75, f. 388 (1808-17).

Astara, N. W. Persia, sea level, 1 ♀, 4th July 1919, (P. A. B.).

Qazvin, N. W. Persia, 1 ♀, 2nd October 1919, (P. A. B.).

Recorded from Mesopotamia and Armenia but not, I think, from Persia.

Sub-family—*Geometrine.*

18. Cabera pusaria, Linn.

Phalæna Geometra pusaria, Linn., Syst. Nat. (ed. 10), i., 522 (1758).

Enzeli, N. W. Persia, sea level, 1 ♂, 21st June 1919, 1 ♂ and 1 ♀, 30th June 1919 (P A. B.).

19. Macaria notata, Linn.

Phalæna Geometra notata, Linn., Syst. Nat. (ed. 10) i., 523 (1758).

Enzeli, N. W. Persia, sea level, 1 ♀, 24th April 1919 (P. A. B.).

20. Macaria signaria, Hb.

Geometra signaria, Hb., Samml. Eur. Schmett., IV., t. 61, f. 313 (1800-08).

Talysh, Persian S. W. Caspian, sea level, 1 ♂, 9th July 1919 (P. A. B.). New for Persia, though known from Armenia.

21. Macaria æstimaria, Hb.

Geometra æstimaria, Hb., Samml. Eur. Schmett., IV., t. 64, f. 333 (1800-08).

Amara, 1 ♀, 15th June 1918 (P. A. B.).

By the shape, tone and underside I think this example really belongs here and not to the following, which is evidently the common *Macaria* of the region.

22. Macaria syriacaria, Stgr.

Macaria æstimaria var. *syriacaria*, Stgr., Cat. Lep. Eur. (ed. 2) 160 (1871).

Kut al Amara, 3 ♀ ♀, 18th June 1915 (1918), 18th and 28th June 1918, also one labelled "Mesopotamia" and undated (Br.); 2 ♀ ♀, 8th and 9th August 1918 (P. A. B.); Amara, 5 ♂ ♂, 1st May, 28th June (2), 10th and 26th August 1918; 12 ♀ ♀, 23rd April ("common"), 25th April, 9th June, 2nd and 4th July. 8th August, 9th August (2), 1st September, 6th September ("2 among weeds in garden") 30th September and 28th October, all in 1918 (P. A. B.); 1 ♂. 31st August 1918, at light (W.E.E.)

Previously recorded from Syria, Cyprus, Armenia and Transcaspia and in the form *tenuiata*, Stgr., from N. Persia. Standinger regards the last named as a possibly distinct species, but unless he would treat the whole of the material before me as referable to it—which is gainsaid by his diagnosis—I think it is *syriacaria* which is the species, with *tenuiata* as an ab. The distal margin of the hindwing is somewhat less crenulate than in *æstimaria* and there are other appreciable differences.

The series is variable. One ♀ (25th April) belongs to the extreme aberration *tenuiata*, a second (25th April) is almost as extreme and the earliest ♂ (1st May) in large measure corresponds, though the dark postmedian line is finer and reaches the costa. It is thus suggested that this form may be characteristic of a first generation or of the earliest emergences. The specimen taken by Capt. Evans is a pretty aberration with strong bands, on the hindwing accompanied distally by a large, irregular dark spot in the middle.

23. Tephrina disputaria, Guen.

Eubolia (?) *disputaria*, Guen., Spec. Gen. Lep. X., 489 (1858).

Amara, cultivated ground by the Chahala Canal, 1 ♂, 24th August 1917 (W.E.E.).

24. Ectropis bistortata, Goeze.

Phalæna Geometra bistortata, Goeze, Ent. Beytr., III (3), 438 (1781).

Enzeli, Gilan, N. W. Persia, sea level, 1 ♀, 30th June 1919 (P. A. B.).

Apparently not very different from our western forms. The range of these widely-distributed species in the Orient is not yet well ascertained, but Staudinger records it (presumably) under the erroneous name of *crepuscularia* from Armenia.

25. Gnopharmia colchidaria, Led.

Gnophos colchidaria, Led., Ann. Soc. Ent. Belg. XIV., 39, 48 (1870).

Menjil, N. W. Persia, semi-desert hills, 2,000 feet, 2 ♂ ♂, 26th and 28th March; 4 ♀ ♀, 26th, 28th and 29th March and 7th April 1919 (P. A. B.).

New for Persia but described from Transcaucasia. Unfortunately I have little material for comparison and the genus needs further study as regards geographical variation. The form before me is darkish, with the contrasts of ground colour and bordering beneath not extremely pronounced.

26. Gnopharmia colchidaria objectaria, Stgr. (?) (sp. div. ?)

Gnopharmia colchidaria var. *objectaria*, Stgr., Iris V., 183 (1892).

Qazvin, N. W. Persia, 4,000 feet, 1 ♂, 27th August 1919.

Lighter and more variegated with reddish than the foregoing, the contrasts of the undersurface extreme. The latter distinction is probably more weighty than the former, as the response of the upperside to the immediate environment is such a marked feature in the *Gnophos* group.

27. Zamacra flabellaria, Heeger.

Amphidasis flabellaria, Heeger, Beitr. Schmett., p 6, f. 6-11 (1838).

Mirjana, near Kizil Robat, Dyala River, 10 ♂ ♂, 6 ♀ ♀, 7th January 1919 (H. D. P.)

More variegated with white than my examples from Syria and on the whole rather large.

ANNOTATED LISTS OF ACULEATE HYMENOPTERA (EXCEPT HETEROGYNA) AND CHRYSIDS RECENTLY COLLECTED IN MESOPOTAMIA AND NORTH-WEST PERSIA.

BY

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(*With eight Text Figures.*)

(*Continued from p.* 828, *Vol.* XXVII.)

29. *Andrena bimaculata*, Kirby var.—1 ♂, Resht (P), 18th February.

According to Schmiedeknecht's tabulation in *Apid. Europ.* This should be *basalis*, Sichel, and it is coloured exactly according to Sichel's description. It can, however, have nothing to do with *albicrus*, of which Sichel supposed *basalis* to be a variety.

Having examined the genitalia, I feel sure that this specimen (and probably *basalis* also!) is merely one of the many highly coloured forms of *bimaculata* which are common in most Mediterranean districts, and occur exceptionally even in England (*decorata*, Sm., etc.) though there they seem to appear only in the second brood. (I have taken one at Wisley (Surrey) in August, which is very nearly as red as Captain Buxton's specimen). *Magrettiana* Schmied. which I found abundant near Naples in March and April, and a ♂ given to me (I believe by Perez) as *atrorubricata*, Dours, seem to be also local varieties of *bimaculata*. I have met with still more highly coloured forms in Tunisia but I do not doubt that these also may be referred to *bimaculata*, K.

30. *Andrena thoracica*, F.—8 ♂ ♂, Resht (P), 1 ♀, 11th-18th February.
1 ♂, 1 ♀, Enzeli (P), 14th-19th June.

31. *Andrena gwynana*, Kirby.—2 ♀ ♀, Resht (P), 25th-27th February.

32. *Andrena lucens*, Imboff.—5 ♂ ♂, Resht (P), 11th-18th February.

33. *Andrena dorsata*, Kirby.—1 ♂, Resht (P), 18th February.

34. *Andrena flavipes*, Pauzer. (=*fulvicrus*, K.), 1 ♂, Resht (P), 18th Febr.,
1 ♂, 1 ♂, Menjil (P), 30th March, 7th April.
8 ♂ ♂, 8 ♀ ♀, Amara (M), 24th March to 18th April.
13 ♀ ♀, Amara (M), 14th May to 19th June.

The March-April Amara specimens are smaller than either those from Persia or the May-June Amara ♀ ♀, but their ♂ ♂ have the peculiarly "notched" stipites of the genital armature by which a *flavipes* ♂ may, I believe, always be identified. (cf. Tr. Ent. Soc. Lond., 1899, p. 237, where the species is called "*fulvicrus*.") The Persian ♂ ♂ shew the same character, but unluckily no ♂ ♂ were taken with the May-June Amara ♀ ♀, and some (but not all) of these differ from normal *flavipes* ♂ ♂ in having the hind femora and tibiæ more or less testaceous. But I believe this character is not specific. Something like it occurs with the "second broods" of other *Andrena* spp. (*e.g. dorsata*) In my opinion all the specimens here recorded should be referred to one species, viz., *flavipes*.

Of all *Andrena* spp. *flavipes* is perhaps the most widely distributed, and its main distinguishing characters seem to be exceedingly constant in all districts. Unless a specimen is badly 'rubbed' there can be little difficulty in determining it.

35. *Andrena hypopolia*, Pérez.—3 ♀ ♀, Qazvin (P), 7th July.

36. *Andrena*, sp?—2 ♂ ♂, 2 ♀ ♀, Amara (M), 24th March-April.

I had thought that these specimens also were *hypopolia*, but after examining the ♂ genitalia I now doubt it. Unfortunately all the specimens are more or less rubbed and faded, so I think it most prudent to leave them nameless.

37. *Andrena cyanescens*, Nyl.—1 ♀, Amara (M), 24th March.

I think this determination is correct, but the specimen has met with an accident and the femora, tibiæ and tarsi of both hind-legs are missing!

38. [*Andrena retula*, Lep.—1 ♀, Basrah (M), 6th April 1919.—Captain Evans.

39. *Andrena cordialis*, Morawitz.— 1 ♀, Basrah (M), 31st March 1919.—Captain Evans.]

I know this species only from the author's description, but the latter seems to agree well with the characters of the specimen before me.

40. *Cilissa leporina*. —1 ♀, Qazvin (P), 17th July.

41. *Nomia diversipes*, Latr.—1 ♂, Qazvin (P), 27th July.

42. *Nomia edentata*, Moraw.—22 ♂♂-17 ♀♀, Amara (M), 1st June to 9th September.
1 ♀, Khaniqin (M), 1st July.
1 ♂, 1 ♀, Baquba (M), 27th July.

The integument in these specimens varies greatly in colour; it may be entirely black, or the abdomen and propodeum may be largely, or even entirely red. The most highly coloured examples before me are males, but at least one ♀ has the whole abdomen dark red. I believe this is merely a matter of individual aberration. It does not seem to be accompanied by any structural differences.

43. *Nomia rufiventris*, Spim.—1 ♀, Amara (M), April.

Spinola's description suits this specimen perfectly. I believe that Morawitz's *rufescens* is the same species. The puncturation is very sparse and feeble, and the basal pilosity of the abdominal tergites consists of long, thin, (not at all scale-like), hairs. The abdomen (but not the propodeum) is entirely red, except the apical margins of the tergites, which are bright yellow.

44. *Eucera dentata*, Klug.*—1 ♂, Enzeli (P), 14th June.

45. *Eucera malvæ*, Rossi.—1 ♂, 1 ♀, Talish (P), 10th July.
1 ♂, Enzeli (P), 14th June.

46. *Eucera radoszkovskyi*, Morawitz.—1 ♂, 1 ♀, Qazvin (P), 17th-24th July.

47. *Eucera distinguenda*. Morawitz.—1 ♂, Amara (M).
[1 ♂, Beit-Na'ama near Basrah (M), 12th April 1919.—Captain Evans.]

48. *Eucera longicornis*, L.—1 ♂, Amara (M), 15th February.
3 ♀♀, Amara (M), 24th March.
1 ♀, Amara (M), 30th March.

These appear to me to belong to the true *longicornis*, L., having the thorax punctured just as in specimens from Britain and other North European countries.

49. *Eucera tuberculata*, F.—1 ♂, Resht (P), 20th March.
1 ♀, Resht (P), April.

This species is the *longicornis*, L., of Friese in *Bienen Europa's*, but apparently not that of Linné. In calling it *tuberculata* I am following the opinion of Herr Alfken, *Bienenfauna von Bremen* (1913).

50. *Nomada fucata*, Panzor.—1 ♂, Amara (M), April.

51. *Nomada tigridis*, n. sp.—1 ♂, Amara (M), 30th March.
4 ♀♀, Amara (M), 28th May-8th June.

This is a fairly large and conspicuously coloured species, but I can find no description to suit it, though several more or less similar forms are recorded by Morawitz (*robusta*, *regalis*, etc.)

The antennæ in both sexes are short and thick with the 3rd joint somewhat shorter than the 4th and the joints near the apex about as broad as long. The mandibles are acuminate; the labrum has a very slight central tuberculation (hardly to be called a tooth) at its apex. The ♀ hind tibiæ have incrassate apices with a sort of small black knob-like projection at each corner (as viewed from behind), between which projections three or four pale subequal spines may be

* This and the next three spp. belong to the *Macrocera* division of *Eucera*.

seen among the fringing hairs. The apical tergite of the ♂ abdomen is deeply incised, so that its apex is bifid or might even be called bispinose.

The general colour of the ♀ is reddish or ferruginous-orange, with the tips of the mandibles, the propodeum, and the apices of the intermediate abdominal tergites, generally also the breast and pleuræ (partly) black. The head and mesonotum either entirely ferruginous, or with more or less blackening of the ocellar area, and some ill defined vittæ on the mesonotum. The pronotum humeral tubercles tegulæ and scutellum are paler (yellowish), the two last abdominal segments have broad fasciæ of a brighter yellow, and there may be traces of similar fasciæ (or at least of lateral spots) on the preceding segments but these, if present at all, are almost obsolete. The antennæ and legs, including the coxæ, are ferruginous or yellowish, with no black marking except at the extreme apex of the hind tibiæ. The punctuation of the head, thorax, and propodeum is close, rather coarse, and more or less reticulate. That of the abdomen is very minute and close, making the tergites look quite dull, except their extreme apices which are impunctate and very slightly shining. The wings are darkened almost throughout, but darkest along their apical margins. The pilosity is short and very scanty, hardly noticeable except, of course, at the apex of the abdomen.

The ♂ has the head (except the face) and the thorax except the pronotum, tubercles, tegulæ, scutellum, and a small spot on the post scutellum black. The abdomen is coloured as in the ♀, except that its extreme base is occupied by a black mark (triangularly produced in the middle). The antennæ are streaked with black over a few of the intermediate joints behind, and the coxæ of all the legs are black. The pilosity of the head and thorax in this sex is pretty long and much more conspicuous than in the ♀.

Length 9 to 11 mm.

52. *Lasius* (=*Anthophora*) * *albigenus*, Lep.—2 ♂♂, Amara (M), 4th-9th Sept.
1 ♀, Baquba (M), 27th July.

53. *Lasius quadrifasciatus*, Vill.— 1 ♀, Qazvin (P), 17th July.

54. *Lasius farinosus*, Kl.—3 ♂♂, Baquba (M), 27th July; 2 ♂♂, Amara (M), 18th-20th July.
3 ♀♀, Amara (M), 10th June (on *Capparis*), 18th-20th July.
[1 ♀, "at or near Amara", 27th August 1918—Captain Evans.]

The specimens before me agree well with Klug's description, and seem to me distinguishable from the commoner *quadrifasciatus* by the much smaller black markings on the face, the testaceous underside of the antennæ (the scape is also lined beneath with whitish-yellow), and the somewhat broader abdominal white fasciæ which are not simply linear, but distinctly dilated in the middle. (In another form belonging to the same group, *viz.*, *wegeneri*, Friese, these fasciæ are on the contrary dilated *at their sides*!) The integument of the abdomen beneath in all these specimens is more or less rufescent at least at the base.

55. *Lasius garrulus*, Rossi.—1 ♂, Talish (P), 10th July; 3 ♀♀, Enzeli (P), 30th June and July.

56. *Lasius Kessleri*, Morawitz.—1 ♀, Beit Na'ama, near Basrah (M), 31st March 1919.—Captain Evans.

57. *Lasius* (*Saropoda*) *byssinus*, Klug.—1 ♀, Amara (M), 7th July.

I have not seen this species before, but feel sure that it is the true *byssinus*. Almost the whole body, except the black triangle at the apex is clothed with white (or whitish), subsquamose, decumbent hairs. The antennæ beneath, the coxæ, trochanters, and femora of all the legs, and the ventral side of the abdomen are testaceous. The front trochanters and femora are fringed on both sides with

* *Lasius*, Jurine (1801) has priority over *Anthophora* (Latr) 1802 and invalidates *Lasius* F et auctt (1804).

a row of slightly curving, suberect, white hairs. Of the hind-legs the femora are nearly naked; but the knees, tibiæ, and bases of the metatarsi have a beautiful snow-white scopa externally, while the other hairs of these joints are absolutely black. The present ♀ (like Klug's type) is 11 mm. long.

58. *Lasius pilipes*, F.—7 ♂♂, Resht (P), 18-25th February; 1 ♀, Enzeli (P), 24th April.

The ♀ is that common Continental form which has its pilosity coloured like that of the ♂, (not black as in British specimens).

59. *Melecta armata*, Pauzer.—1 ♀, Resht (P), 25th February.

60. *Crocisa ashabadensis*, Radosz.—1 ♀, Amara (M), 14th June.

61. *Xylocopa olivieri*, Lep.—1 ♂, 1 ♀, Baquba (M), 30th July.

I have noticed, both in Greece and in Syria, that the ♂♂ of this species have the curious habit of suddenly visiting flowers in great numbers about the time of sunset. Earlier in the day that sex is usually nowhere to be found.

62. *Xylocopa fenestrata*, F.—3 ♂♂, Amara (M), 10th-19th June, 1st September.

3 ♀♀, Amara, 1st May, 10th June (visiting *Capparis*), 19th June.

[1 ♂, Beit Na'ama near Basrah (M), 23rd March 1919 "at *Papaver somniferum*."—Captain Evans.]

This is a common "Oriental" species, only exceptionally reaching Palearctic districts!

63. *Xylocopa violacea*, L.—4 ♀♀, Enzeli (P), 8th, 14th, and 17th June.

64. *Ceratina tibialis*, Morawitz.—1 ♂, Amara (M), 8th June; 1 ♂, Baquba (M), 21st July.

2 ♂♂, 9 ♀♀, Amara (M), 12th September

[3 ♀♀, near Basrah, 31st March 1919—Captain Evans].

65. *Ceratina nigrolabiata*, Friese.—1 ♂, Amara (M), 9th September; 1 ♀, Baquba, 27th July.

The ♀ is very small, and may possibly be some species unknown to me. The clypeus is almost impunctate on its disc, and the frontal area and mesonotum are very sparsely punctured and shining. But in coloration it exactly matches a *nigrolabiata* ♀ named for me by the author of the species.

66. *Ceratina laevifrons*, Morawitz.—1 ♀, Shahroban (M), 21st July; 1 ♀ Baquba (M), 27th July.

67. *Ceratina cyanea*, Kirby.—1 ♂, 2 ♀♀, Enzeli (P), 6th June.

One of the ♀♀ is not quite a normal specimen, having a very small yellow spot in the middle of its clypeus. But I believe this is merely an individual aberration.

68. *Chelostoma emarginatum*, Ngl.—1 ♀, Enzeli (P), 1st May.

I give this name with some little doubt, because I only know the species in literature, and the present specimen has no less than 10 alar hooks, which does not agree with Schletterer's statement in Zool. Jahrb., 1889 (p. 619). But its other characters suggest *emarginatum*, and that species has been previously recorded from N. W. Persia.

69. *Osmia cœrulescens*, L.—1 ♀, Qazvin (P), 17th July.

70. *Osmia indigotea*, Morawitz (?)—1 ♂, 1 ♀, near Basrah (M), 31st March 1919.

71. *Osmia panzeri*, Morawitz.—1 ♂ near Basrah (M), 12th April 1919.

These specimens (70 and 71) were all taken by Captain Evans in the same locality and I thought at first that they were conspecific. But the very different ventral segments of the two ♂♂ shew that this is not so, and I believe the

determinations given of them above are probably correct. It is almost impossible, however, to name, for certain, ♂♂ of this section without special preparation of the specimens, the actual apex of the abdomen being nearly always imperfectly exposed.

72. *Osmia dimidiata*, Morawitz.—4 ♂♂, Enzeli (P), 8th-14th June.

73. *Anthidium florentinum*, F.—2 ♂♂, Enzeli (P), 10th-23rd July.
2 ♀♀, Talish (P), 5th-10th July.
1 ♀, Qazvin (P), 17th July.

74. *Anthidium strigatum*, Panzer.— 1 ♀, Baquba (M), 27th July.

The specimen is below the usual size, and its ground colour, instead of being simply black, is partly rufescent both on the thorax and abdomen. Probably this may be an individual aberration, but it may again be characteristic of a special local race. I do not think the peculiarity is "specific." [Captain Evans took a ♂ near Basrah on 12th April 1919.]

75. [*Anthidium tessellatum*, Kl.—1 ♂, Tanooma (M), Lieut. Harwood, "October."]

76. *Stelis phœoptera*, Kirby.—1 ♀, Talish (P), 10th July.
1 ♀, near Basrah (M), 6th April 1919.

The Persian specimen was very much larger than the Mesopotamian.

77. [*Stelis signata*, Latr.—1 ♂, near Basrah, 10th April 1919.—Captain Evans.]

78. *Lithurgus chrysurus*, *Fonsc.*—3 ♂♂, 4 ♀♀, Enzeli (P), 15th-17th June.

79. *Lithurgus tibialis*, Morawitz.— 1 ♂, Khaniqin (M), 1st August.

This specimen agrees exactly with Morawitz's description. In May 1896 I took at Dakrur in Egypt a ♂ which was determined for me by Prof. Friese, no doubt correctly, as belonging to this species. But it was a much smaller specimen than that here recorded, and the paradoxical characters of its hind legs (perhaps only for that reason) appear to me not quite so well developed. In the Figure below (Fig. 5) I have tried to give the exact outline of the right hind leg in Captain Buxton's specimen, when so placed that its *inner* side almost directly faces the object glass of the microscope. (The legs are clothed, rather thinly, with white hairs, which are very long and fine in the angle between the femora and tibiæ, much shorter and more bristle-like on the metatarsus, but I have not attempted to show this pilosity in the Figure.)

As usual in *Lithurgus* spp., the ♂ genitalia are extremely small for the size of the insect. I notice that in this species the interval which separates the posterior ocelli from each other is at least twice as great as that between each of them and the nearest compound eye. This is not the case in *chrysurus*, where the difference in length between the corresponding spaces is very slight.

When viewed from behind the hind tibiæ are seen to be not only *dilated*, but very *incrassate*, only, however, about half as much so as the femora.

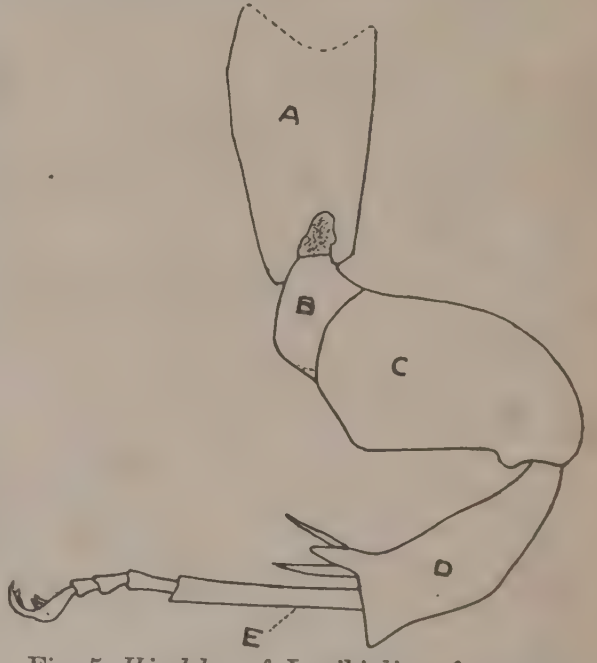

Fig. 5. *Hind-leg of L. tibialis* ♂, *a.* coxa. *b.* trochanter, *c.* femur, *d.* tibia, *e* metatarsus.

80. *Megachile argentata*, F.—1 ♂, Amara (M), 20th July: 2 ♂♂, Baquba (M), 27th July.
1 ♀, Shahroban (M), 31st July.
[1 ♂, below Amara (M), "about Tamarisk" 31st August.—Captain Evans.]

About 20 specimens, smaller than the above, but apparently all *argentata* ♂♂ and ♀♀ were also taken at or near Amara by Captain Buxton in June, July, and September. Some of those taken in September were visiting Sunflowers, others *Zizyphus*.

81. *Megachile minutissima*, Radosz (?)—13 ♂♂, 14 ♀♀, Amara (M), 28th May to 14th June.
1 ♂, 2 ♀♀, Shahroban (M), 31st July.

I have named these chiefly in consequence of having compared them with ♂♂ which I took in Egypt in 1899, and which were determined for me as *minutissima* by Professor Friese. But except in size (and not very much even in that!) they differ very little from *argentata* ♂♂. Captain Buxton's ♀♀, however, certainly differ from *argentata* ♀♀ in having no silvery pilosity on the last abdominal segment. All these specimens, both ♂♂ and ♀♀, are small, but they vary considerably in size, and it is curious that the smallest of them all are ♀♀! One of these is only 6 mm. long, while another measures fully 8 mm. (Radoszkowsky gives 7 mm. as the length of the ♀, and 6 as that of the ♂).

82. *Megachile rotundata*, F.—6 ♂♂, Astara (P), 2nd July, 1 ♀, Enzeli (P), 6th June.
1 ♀, Talish (P), 10th July.

83. *Megachile schnabli*, Rad.—3 ♂♂, Amara, 14th and 17th June, 6th September.
[1 ♀, 6th September, "garden below Amara."—Captain Evans.]

All these ♂♂ agree with Radoszowsky's description, except that the colour of the abdomen seems to be altogether variable. In one specimen (June 17th) it is completely reddish, and the scutellum is red also! In the other two the antennæ, legs, and venter are red, but the dorsal surface of the body shews hardly any tendency to rufescence. The pilosity of all three specimens is very dense and silvery, giving them that peculiar sheen which characterizes so many desert-frequenting Hymenoptera.

84. *Megachile flavipes*, Spin.—13 ♂♂, 8 ♀♀, Amara (M), 28th May to 9th August.
2 ♀♀, Qazvin (P), 17th July.

85. *Megachile maritima*, K.—1 ♀, Enzeli (P), 30th June.

86. *Megachile centuncularis*, L.—1 ♂, Talish (P), 10th July; 1 ♀ Enzeli (P), 20th June.

87. *Cœlioxys conoidea*, Klug.—2 ♂♂, 1 ♀, Talish (P), 5th-10th July.

88. *Cœlioxys elongata*, Lep.—1 ♀, Enzeli (P), 8th June; 1 ♀, Talish (P), 10th July.

89. *Cœlioxys decipiens*, Spin.—1 ♂, 8 ♀♀, Amara (M), 10th-14th June. (visit flowers of *Acacia*.)

90. *Cœlioxys argentea*, Lep.—1 ♂, Qazvin (P), 17th July.

91. *Cœlioxys brevis*, Eversm.—1 ♂, Talish (P), 11th July.

92. *Cœlioxys afra*, Lep.—1 ♂, Amara (M), 12th September.

93. *Cœlioxys haemorrhoa*, Forst.—2 ♂♂, Amara (M), 18th July, 9th September.
1 ♀, Baquba (M), 27th July.

94. *Cœlioxys coturnix*, Pèrez (?)—1 ♀, Amara (M), June 26th (also, between June 19th and 22nd at Amara a ♂ which seems to belong to the same form).

In both these specimens the abdomen is practically unicolorous, rosy-testaceous throughout! Otherwise the ♀ appears to have exactly the characters by which Pérez separated his *coturnix* from *hæmorrhoa*. (He was not acquainted with the ♂). There is the same 'powdering' over of the vertex, mesonotum, etc., etc., with silvery scales (mostly oval in form, but some of the smaller ones almost circular!) the same fine close puncturation, and the same sort of "caréne" which Pérez describes as running into the "premarginal depression" of the 6th abdominal dorsal-plate.

I took at Biskra in Algeria 2 ♀ ♀ which seem to differ from Captain Buxton's specimen only in being much smaller, and these were recorded by Edward Saunders in *Trans. Ent. Soc., Lond.*, 1908, p. 241 as "*coturnix*, Pérez(?)." I have also taken a ♀ at Jericho which is slightly larger than the Amara ♀, and has two of its abdominal segments (the 4th and the 5th) blackish above. Otherwise this also agrees with the Mesopotamian form.

The ♂ so much resembles the ♀ in colour and general appearance, and was taken so nearly at the same time, that I can scarcely doubt that the two are conspecific. Apart from colour and pilosity I have not succeeded in finding any substantial difference to distinguish it from *hæmorrhoa* ♂. The "eight teeth" on the apex of the abdomen seem to be very similar and arranged in the same way. (Fig. 6. Outlines of the 6th abdominal tergite viewed from above. I have not attempted to represent the fovcation, pilosity, etc., of the segment. As in *hæmorrhoa* it is deeply and widely sulcate down the middle, and clothed with scale-like hairs at its base.)

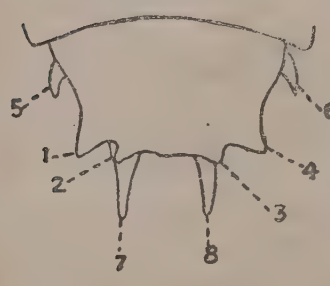

Fig. 6. *Outlines of 6th abdominal tergite in C. coturnix.*

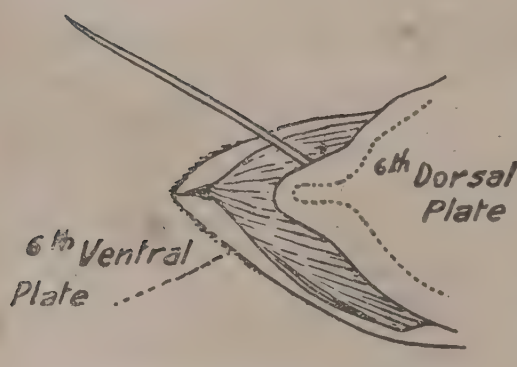

Fig. 7. *Apex of abdomen in C. coturnix.*

(Fig. 7 represents the apex of the ♀ abdomen viewed from above. The dotted lines are meant to give an idea of the "premarginal depression" and what Pérez calls its "interruption" by the carina which projects into it.

The apex of the 6th ventral plate seems to be quite pointed, not narrowly truncate and very slightly emarginate, as usually in *hæmorrhoa*.)

95. *Cœlioxys obtusa*, Pérez.—2 ♂♂, Amara (M), 14th-15th June.

One specimen has the first 3 abdominal segments red, in another there is only a touch of that colour at the base of segment 1. (In a ♂ from Gibraltar given to me by E. Saunders the abdomen is entirely black, and it seems to have been so in the specimen described by Pérez.)

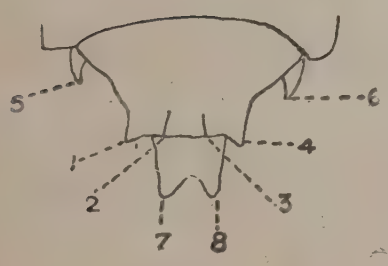

Fig. 8.
96. *Apis mellifera*, L.

The 'teeth' which form the actual apex of the abdomen (Nos. 7 and 8 in the Figure) are very unlike those of *hæmorrhoa* and "*coturnix* (?)."

Instead of being long slender spines, they are short and broad, with broadly subtruncate apices and their inner margins converging rapidly almost at right angles. (All the 'teeth' in this species seem liable to vary somewhat in shape. They are even sometimes distinctly asymmetrical. Notwithstanding this, their general appearance is so far uniform and unlike that of those in *hæmorrhoa* that specimens of the two can always be distinguished at a glance by the characters of this segment only!)

The figure above (Fig. 8) is drawn from the redder of the two ♂♂, and the so-called teeth are numbered as in the corresponding figure (Fig. 6) of the ♂ apex in "*coturnix*?"

Several specimens were sent by Captain Buxton's from N. W. Persia (Resht, Enzeli, Kermanshah,) but none from Mesopotamia. All were workers, and belonged to the var. *fasciata*, Latr.

List 3, Wasps.

1. *Vespa crabro* L. var. *crabroniformis*, Smith.—1 ♀, Enzeli (P), 25th June.

This specimen is exactly like the Type (at S. Kensington!) of Smith's *crabroniformis* described from N. China as a new species. It only differs from normal examples of *V. crabro* in having very narrow—in fact almost linear—yellow bands on the 3rd and 4th abdominal tergites.

2. *Vespa orientalis*, L.—1 ♀, Amara (M), 25th June.
2 ☿☿, Amara (M), 6th July.
[1 ☿, Amara (M), "from nest in roof of building" 17th August 1918.—Captain Evans.]
1 ☿, Shahroban (M), 31st July.

All these belong to the bright red and yellow typical form of the species.

The darker variety *ægyptiaca*, André, occurred in N. W. Persia (1 ♀, Qazvin, 25th July.)

3. *Vespa germanica*, F.—Many ♀♀ from Persia (Kermanshah, Enzeli, Qazvin, etc.) also 3 ♂♂, Kermanshah, 3rd and 4th December, 1 ♀, Enzeli, 20th June.

No specimens have been sent to me from Mesopotamia, nor is that country cited in the list of Asiatic localities given for *germanica* in R. du Buysson's *Monogr. des Guepes ou Vespa* (1904).

4. *Polistes gallicus*, L.—Many ♀♀ and ♀♀ were taken by Captain Buxton in Persia, but no ♂♂, [Captain Evans also sent a ♀, one of "three found under a stone," 22nd January 1919, from Harunabad (P).] In Mesopotamia the species seems to have been completely anticipated—or evicted?—by *P. hebræus*. At any rate none have reached me from thence.

It may be that I am including under the Linnean name *gallicus* more than one of several forms which have been separated by Kohl on account of differences in their ♂♂. There are certainly, there as elsewhere, two easily distinguishable types of coloration. Specimens taken at Resht and Enzeli between February and June were much darker and generally larger than others which occurred at Qazvin and Menjil (July-September). But the Harunabad ♀ "hibernating under a stone" in January was of the light form.

5. *Polistes hebræus* (*macœnsis* ?), F.—Of this species Captain Buxton took several ♀ ♀ at Amara (M) between November 1917 and June 1918, and seven ☿ ☿ at Amara and Baghdad (M) during the same period and in July. [Captain Evans found ☿ ☿ later also, *viz.*, in August and September 1918.]

I have compared these specimens with Fabricius's original Type of *macœnsis* in the Banks Collection; and, like it, they are very pale forms with hardly any black markings. In most of them the mesonotum appears quite immaculate.

But I prefer to call them *hebræus* which is the older name, because, after careful consideration of all Fabricius's many descriptions of his *hebræus* and *macœnsis*, I can find absolutely nothing to shew why he thought them distinct. Some authors hold that the two differ in colour, *hebræus* being a darker insect. It is true that some so-called *hebræus* and *macœnsis* specimens differ in this respect. But all the many specimens of both that I have seen appear to be mere individual aberrations from a single specific Type, and both forms certainly occur together in most of their Oriental habitats, together with many others which are intermediate between them. The original descriptions are to all intents and purposes identical; and though Fabricius names one from Palestine (*hebræus*), and the other from China (*macœnsis*,) he cannot have meant to distinguish them as differing in 'habitat.' For he gives "India orientalis" as the habitat of *hebræus*, and "Macao Indiæ" (sic !) as that of *macœnsis* ! On the whole I believe that the two names should be treated as synonymous, and that of the two *hebraeus* has "priority" over the other.

6. *Eumenes coarctata*, L.—1 ♀, Qasr-i-Shirin (P), 24th November 1918.

This is the *mediterranea* of Kriechbaumer, the common form in most southern districts. Both *mediterranea* and *pomiformis*, F, are probably only varieties (local races) of the Linnéan species.

7. *Eumenes esuriens*, Pauzer.—2 ♂ ♂, Shahroban (M), 31st July; Amara (M), 17th September.
1 ♀, Amara (M), 9th September.
1 ♀, Kurna (P), 20th May.
[1 ♂, Amara (M), 17th August.
1 ♀, Amara (M), 27th August—Capt. Evans.]

8. *Odynerus simplex*, F.—1 ♂, 2 ♀ ♀, Talish (P), 10th July.

9. *Odynerus parietum*, L.—1 ♀, Qazvin (P), 20th September.

10. *Odynerus melanocephalus*, Gmel.—6 ♂ ♂, 1 ♀, Amara (M), 3rd March to 19th June.

In the ♀ and in four of the six ♂ ♂ the scutellum bears two distinct yellow spots, in another ♂ they are almost invisibly small, and in the June ♂ the scutellum (as in normal *melanocephalus*) is immaculate. (I do not suppose this character to have any systematic significance, but it is as well to mention it.)

11. *Odynerus chloroticus*, Spin.—1 ♂ and 1 ♀ Amara, (M), September.
[1 ♀, Beit-Na'ama near Basrah (M), 12th April 1919.—Captain Evans.]

12. *Odynerus crenatus*, Lep. (?)—1 ♂, Amara (M), 28th May.
[1 ♂ "Four miles below Amara, 17th September.—Captain Evans.]

These are very highly coloured specimens, but I think they do not differ specifically from specimens determined as *crenatus* by Professor Pérez.

13. *Odynerus transitorius*, Morawitz.—9 ♂ ♂ and 11 ♀ ♀ of this exceedingly pretty little species were taken by Captain Buxton at Amara and Shahroban (M). [Captain Evans also found it at Beit-Na'ama (M) on April 12th, 1919.] Many specimens, apart from their 'pictura pallida,' were largely or even entirely red. They were flying in April, May and June, and frequented the flowers of an Acacia. [Captain Evans's specimen occurred "about Tamarisk."] The

species as Morawitz has remarked, much resembles the Algerian *blanchardianus*, specially in the peculiar carinated base of the 1st abdominal tergite (the carina distinctly interrupted in the middle !)

14. *Nortonia deceptrix*, n. sp.—4 ♂♂, April ; 1 ♂, 28th May ; 1 ♀, 14th May, Amara (M).

In many respects, and especially in the form of its 1st and 2nd abdominal segments, this species much resembles one which I described from several ♂♂ taken on February 12th, 1901, at Abba Eiland, by the Swedish Expedition to Egypt and the White Nile (See Ann. and Mag. N. H., December 1903).* This no doubt was also a *Nortonia*, but I wrongly referred it to "Odynerus (Ancistrocerus ?)" and called it *aberraticus*.

The Mesopotamian species however seems to be certainly different from the Egyptian in several characters of specific value. (*a*) The scutellum is transverse and not almost quadrate, (*b*) the excision of the strongly bidentate ♂ clypeus is not triangular, but semi-circular, (*c*) the lateral angles of the pronotum are distinctly subspinose, (*d*) the costæ at the base of the 2nd ventral segments are fairly long, (*e*) the mandibles of the ♂ appear to be simply acuminate and not tridentate.

I notice also that the very coarse rugosities of the mesonotum, when viewed from behind, appear as definite longitudinal strigæ. I do not remember that the specimens I examined in 1903 shewed any such character, and I find no mention of it in the description of Kohl's *N. moricei*.

The scutellum and postscutellum are both entirely yellow in *deceptrix* : the former in the Egyptian species is black, and the latter only shews two small spots of yellow. The colour of the abdomen varies to some extent in the specimens now before me, but in most of them there is certainly more yellow and less black than in the types of "*aberraticus*."

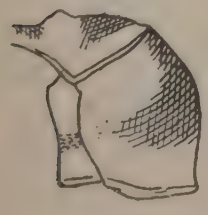

Fig. 9 A.

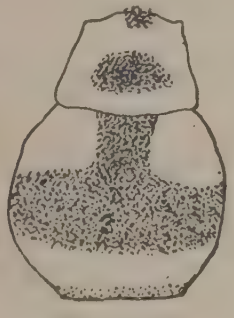

Fig. 10 B.

The accompanying sketches (Figures 9 and 10) representing the 1st and 2nd segments (viewed A *laterally* and B *dorsally*) in the brightest of the ♂♂, will give an idea of this. In the only ♀ there is a larger black triangle on the disc of segment 1, but on its 2nd segments there is more yellow still, the yellow lateral maculæ at its base being all but actually confluent !

First and second segments in N. deceptrix.

The lateral margins of the propodeum are very spinulose throughout, as is also the crest of the postscutellum which resembles those of *O. blanchardianus* and *transitorius*.

List 4. Chrysids.

1. *Hedychrum rutilans*, Vahlb.—1 ♂, Kazvin (P), 17th July.
2. *Hedychridium hilare*, n. sp.—1 ♂, Amara (M), 25th June.

At first sight this might be taken for an extreme variety or aberration of the common *H. roseum*. The colour of the abdomen much resembles that which characterizes the latter, and contrasts in the same way with the prevailing greenness of the head and thorax. But the postscutellum and propodeum (except

* One of the same specimens, or one taken at the same place and on the same day, was described three years later by Kohl in his admirable work on Hymenoptera from South Arabia and Socotra, Wien, 1906, as *Nortonia moricei*, n. sp. He accredits the capture to me, but I never visited Abba Eiland, and was not in Egypt at all in 1901.

its lateral angles) are not green at all, the former being violaceous and the latter testaceous. Again, though in certain aspects the pronotum appears to be green, its real ground colour seems to be testaceous, as is also that of the antennæ, the mandibles, the sides of the face, and the whole of all the legs. The vertex, however, and the tempora are distinctly green, like the mesonotum and scutellum, but there is a slight touch of a warmer colour (reddish-golden) between the ocelli and the compound eyes. Seen from beneath the whole body appears testaceous and polished, except the green mesopleures, and occasional reflections of the same colour playing over the legs which become visible only in certain lights.

But apart from mere colour, it seems to be certainly distinct from *roseum* by more important characters.

(1) The antennæ are shorter and stouter, with joints 2, 3, and 4 subequal but joint 4 slightly longer than the others. (In *roseum*, joint 3 is evidently longer than 4, and fully twice as long as 2.)

(2) The green areas of the thorax are very shining, and their puncturation irregular and mostly very sparse. (In *roseum* the whole thorax is almost opaque, its puncturation being uniform and close.) This difference is apparent even to the naked eye.

(3) The abdomen, especially its basal segment, is also much more sparsely punctured than that of *roseum*, the punctures being everywhere separated by intervals much larger than themselves.

(4) The face, which is bright metallic green in the middle, but testaceous at the sides and below the antennæ, is clothed with very short silvery pubescence, conspicuous in some lights, but in others quite invisible, and not concealing the sculpture of the integument. This is very small and shallow (sub-coriaceous) and contrasts strongly with the much coarser rugose puncturation of the vertex. (In *roseum* ♂ the face is deep-blue, the few hairs on its surface are fairly long but quite inconspicuous, not appearing silvery (so far as I can see) in any aspect, and the integument is punctured very much in the same style as that of the vertex.)

(5) The wings are perfectly clear. (In *roseum* they are distinctly infuscated.)

3. *Chrysis fuscipennis*, Brullé.—1 ♀, Amara (M), 28th October.
4. *Chrysis palliditarsis*, Spin.—3 ♂♂, 4 ♀♀, "on *Acacia*," Amara (M), 10th June.
   2 ♀♀, Amara, 13th-17th June.
5. *Chrysis blanchardi*, Luc.—1 ♂, Amara (M), 6th September.
6. *Chrysis maculicornis*, Kl—3 ♂♂, Amara (M), 10th June "on *Acacia*," 14th June, 18th August.
7. *Chrysis exigua*, Mocs.—1 ♂, Amara (M), April.
   5 ♀♀, Amara, 10th and 13th June "on *Acacia*."
8. *Chrysis ignita*, L.—2 ♀♀, Talysh (P), 18th July.
9. *Chrysis scutellaris*, F.—1 ♀, Amara (M), "on Sunflower" 12th September.
10. [*Chrysis cyanopyga*, Dahlb.—1 ♀, Beit-Na'ama (M), 10th April 1919.—Captain Evans.]

The last 8 species (3 to 10) all belong to the Section "*Tetrachrysis*."

11. [*Chrysis* (*Hexachrysis*) *stilboides*, Spin.—1 specimen taken "at or near Amara," 18th August 1918. I omitted to take note of the sex.—Captain Evans.

12. *Chrysis buxtoni*, n. sp.—1 ♂, Amara (M), 10th June.

This must also, no doubt, be reckoned as a *Hexachrysis*, though four of its so-called "teeth" only are really tooth-like. The outermost pair are *lateral*, situate one at each end of the series of foveæ. The intermediate pair are *apical*,

these are sharp and spine-like. The innermost pair are merely obtuse undulations of the margin (See figure 11). By its coloration it belongs to the Section known as *Viridis.*

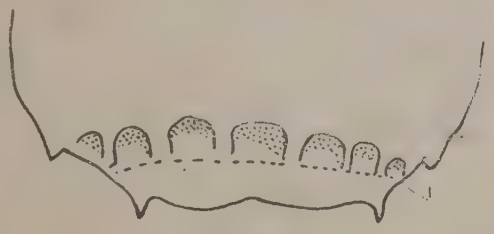

Fig. 11. *Apex of abdomen in Chrysis buxtoni* ♂.

Body above almost entirely bright metallic green, but with a more fiery (reddish-golden) tinge at the sides of the mesonotum, and with the tegulæ deep dark blue. Venter partly concolorous with the dorsum, partly blue, indigo, violet, etc. (the colours blending where they meet, and as in many other species with a pair of large rounded spots (black with violet reflections) at the base of its 2nd segment. Antennæ fuscous, densely clothed with minute, white sub-erect hairs: joints 1, 2, and a part of joint 3, green. Legs green, with yellowish (non-metallic) knees and tarsi. Wings clouded in the middle, but quite clear at base and apex. Face and genæ (between eyes and mandibles), clothed with silvery hairs. Pilosity of dorsal surface short and inconspicuous, but the femora and tibiæ are fringed with rather long pale hairs.

Head about as wide as the pronotum. Third antennal joint about as long as the second and fourth together. Least length of the cheeks about equal to that of the second antennal joint. From near each end of the rather vaguely carinated brow which overhangs the facial cavity a very distinct carina runs backward into the ocellar area, nearly isolating the anterior ocellus from the others. (Fig. 12.)

The apical half of the pronotum is sulcate longitudinally, and its lateral angles (=shoulders) subspinose. The dorsum of the abdomen is evidently but not strongly carinated longitudinally. The head is closely punctured (this is not shewn in the Figure): the thorax and abdomen less so, and much more coarsely (about as in *C. micans*, Dahlb.). On the sides of the mesonotum the punctures are especially large and sparse.

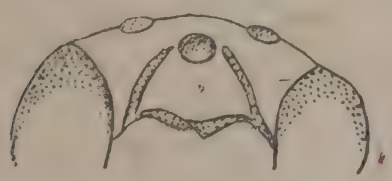

Fig. 12. *Upper part of head Chrysis buxtoni* ♂ *Viewed from in Front.*

Length of body about 7 mm.

[I have not attempted to shew the puncturation of the head, which would have made the 'characters' I desired to illustrate more difficult to see.]

13. *Stilbum cyanurum*, Forster.—One specimen of the typical form was taken "at or near" Amara by Captain Evans. I forgot to take note of the sex.

14. *Parnopes grandior*, Pall. (=*Carnea*, F.)—1 ♂, Enzeli (P), 30th June.

Nearly all the Mesopotamian Chrysids mentioned above occur also in R. du Buysson's List of Egyptian forms (*Mem. Soc. Ent. d'Egypte*, Cairo, 1908.)

QUAINT BEASTS AND QUEER HABITS.

BY

MAJOR C. H. STOCKLEY.

Every wandering sportsman has at times come across strange animals or observed strange habits or actions of more common species which stand out clear-cut amongst the memories of shooting or fishing trips. Sometimes it is some particular physical feature of the beast, such as the bright orange teeth of the Bamboo Rat (*Rhizomys badius*) found in Central and Lower Burma; at others it is the general build of the beast whose strangeness makes a first encounter memorable. For instance the beast known as the Armoured Pangolin presents a weird and formidable appearance, sheathed as it is in overlapping scale armour, and its four feet or so of length make it a sufficiently alarming apparition when met on the lawn of the mess on a moonlight night after dinner, which was the manner of my first encounter with the species. Another beast which startled me into immediate reminiscences of "Alice through the Looking Glass," was a Binturong; a quaint medley of fox, badger and racoon, which ran across my path when travelling up the Salween valley near the Burma-Siam frontier. Then I defy anyone who has really read and enjoyed the aforementioned book, not to be reminded of the illustration of a "slithy tove" when he sees his first specimen of an "aard vark". The first one I ever saw was discovered by the adjutant of my battalion of the King's African Rifles undermining his tent in the middle of the night when camped in Somaliland. The most strenuous efforts of two lusty officers, who attached themselves to his (the aard vark's, not the adjutant's) tail, failed to extract him from the hole which he had already dug, and which was about three feet in depth. Finally a revolver bullet finished him, and he was duly photographed and skinned next morning. From the uproar over his capture you might have thought that the dervishes had rushed the camp.

Occasionally it is the incongruity of the beast with its surroundings that strikes one, as any one will agree who has seen a couple of Himalayan Langur monkeys sitting on the snow-laden boughs of a pine. One feels that monkeys and Christmas trees have nothing in common, and that animals which one associates from childhood with hot weather and cocoanut palms should have retired to the plains at the end of the summer in company with the Brass Hats, Grass Widows and Simla Wirepullers.

Talking of monkeys, while on a hillside high above the Chenab river, I once spotted a troop of monkeys far below on the opposite bank, amongst whom was one the colour of whose coat can only be described as a bright orange. At first I thought that something had gone wrong with my eyesight or my field-glasses, while my shikari stoutly maintained that no monkey was ever coloured like that, therefore it could not be a monkey. To settle the point we descended about a thousand feet until we were opposite the troop and only separated from them by the width of the river, here about eighty yards. We then sat and watched the freak specimen with our glasses for half-an-hour. He seemed in every respect, save that of colour, to be an ordinary Hill Macaque, such as swarm in parts of the Lower Himalayas; and his companions seemed to notice nothing queer about him. As we rose to go I asked my shikari what the people of his village would say when he told them that he had seen a monkey of such an outlandish colour. He replied, "They will say, I am a liar." When we got back to his village he proved to be absolutely correct, and on my backing his statement, I was obviously looked on as a rather clumsy accomplice.

It was with the same shikari that I one day lay on a hill-side waiting for a serow to come out and feed as soon as the heat of the sun should abate a little, the while I idly directed the telescope on likely places for game. In doing so a goral

lying on the opposite side of the valley came into the field. I watched him for a bit without any great interest ; for, though a good buck, I had shot several as big, until he did a thing I have never seen done by any other animal. Some fifty yards from him in the shade of an overhanging rock, lay a bank of snow some three feet thick which had melted as far as the rays of the sun could reach it and then presented an upright frozen face with an upper edge of almost solid ice, the product of the hard night frosts. The goral rose and walked over to this bank of snow ; then, having evidently become uncomfortably warm through lying in the sun, he proceeded to chew off great lumps from its solid edge, swallowing large quantities and leaving wide gaps in its continuity. This he continued to do for some ten minutes, showing more than a schoolboy's capacity for ices, and almost giving me a sympathetic pain in 'Little Mary.'

The victim of the most wonderful tragedy of wild life that I have ever witnessed was another wild goat ; an ibex to wit. A herd was traversing a perilous face of rock by means of a slight fault across its slippery surface. Amongst the herd were several young ones, and, as one of these crossed behind its mother, down out of the sky swept two great Lammergeiers, eight and half feet from wing-tip to wing-tip, and so beat and buffeted the poor little kid that it finally fell half senseless, and was whirled to destruction on the crags below ; its murderers sailing down to feast on the carcase. I have seen a good deal of the Lammergeier in different countries, and never observed a like incident or indeed heard of their killing anything bigger than a new-born lamb.

As a laughter-provoking nature comedy, it is hard to beat a hungry wolf stalking marmots. He will spend an hour creeping nearer to a marmot who pretends not to see him, but sits solemnly like a fat little alderman, on top of the low mound of earth at the entrance to his burrow, in seeming blissful ignorance of peril. Then, just before the wolf arrives within springing distance, the marmot whips round, whistles shrilly and dives into his home, while the wolf bruises his nose on the doorstep in a wild and futile rush. Then the marmot pops up at another exit a few yards away and challenges the wolf with another whistle, the result again being a profitless attempt by the wolf to secure the fat and tempting meal. More members of the marmot colony now appear on the thresholds of their burrows and whistle derisively on every side of the marauder, who, after one or two more vain efforts to secure a dinner retires in impotent rage from the unequal contest ; usually to lie sulking on the hill-side overlooking the colony in the hope of cutting off a member of it who may, later on, venture too far from home on a grass-gathering expedition.

Twice I have watched this comedy through my telescope, till my sides ached with laughing, and my Tibetan companions (unable to see the cause of my mirth) suspected me of being suddenly smitten with madness. On the first occasion I rang down the curtain by slaying the would-be slayer ; on the second he was warned by a wandering back-eddy of wind and made off in safety.

Unfortunately for the game, wolves have greatly increased in numbers in Ladakh of late years, and the unusually deep snow in the Rupshu district during the winter of 1910-11 gave them an advantage over their quarry which enabled them almost to annihilate the Tibetan gazelle in some places, and everywhere greatly reduce their numbers and those of the great Tibetan Sheep *Ovis ammon*. For the hard, sharp-edged feet of the sheep and gazelle made them sink deeply into the snow while the splayed-out pads of the wolves kept them from going far below the surface. The *Ovis ammon* owing to their greater size and height off the ground were not nearly so heavily handicapped as the gazelle by the eighteen inches of snow which lay everywhere, and so did not suffer nearly as heavily, while the kiang were hardly affected at all.

In August 1911, I was travelling up the left bank of the Indus close to where it first enters Kashmir territory and flows placid and gentle beside wide flats of short turf. As I walked about half a mile ahead of my baggage yaks, I spotted

a wolf sneaking along a small grassy depression in which three Kiangs or Tibetan Wild Asses were feeding. It seemed to me that a solitary wolf would hardly tackle as big a beast as a Kiang, but I was hardly prepared for the utter indifference shown by the latter, who scarcely troubled to raise their heads to stare at the wolf, as he passed between two of them feeding not ten yards apart. I then saw that he was making for a large flock of sheep, which were grazing some 250 yards further on, their Tibetan shepherds being squatted round a small fire on the river bank as much again beyond them. The wolf having arrived within forty yards of the flock seemed to cover the intervening ground like a streak of lightning and pulled down a ram with one jerk of his powerful jaws, seizing it behind the ears. He then proceeded to tear open the stomach of his prey, while the remainder of the flock fled about eighty yards, and then turned to stare, a huddle of woolly idiocy. The wolf then left his ram and began to trot slowly towards them. When he was within fifty yards they turned and began to flee, their enemy cantering behind them until he had shepherded them into galloping at top speed. He then spurted suddenly in the most amazing manner into the middle of the flock and pulled down sheep after sheep with such wonderul speed and dexterity that there were five lying on the ground within a distance of thirty yards. His method was extraordinarily interesting. He came up on the right side of each sheep (thereby bearing out the theory that most carnivora are left-handed) and, seizing the galloping sheep behind the right ear, jerked its head downwards and inwards so that it pitched on its nose, the result being that it was stunned by the combined effect of the downward jerk and the impact of its own fall almost or quite dislocating its neck. At the fifth sheep the wolf stopped and began to tear open its stomach, as he had done with the ram he had first pulled down. The shepherds then ran up and drove him off. I thought he would probably come back to the first ram, and ran to try and get a shot ; but running at 14,000 feet above sea-level is difficult work, and I had to sit down about two hundred yards from it just as the wolf arrived there. Before I could get my sights on him, he saw me, and immediately broke into a lope whose pace was so deceptive that, although I thought I had allowed almost more than enough in front of him, my bullet passed behind his tail, and he departed at a rate which made shooting with any chance of hitting a task beyond my powers. Of the six sheep which he had pulled down, the first ram was on its legs again, a piteous sight, its bowels dragging tumbled on the ground. Of the final batch of five only the last was dead, the other four all getting on their legs and staggering about dazed and giddy.

It seemed to me that I had seen the Tibetan wolf's usual way of securing a stock of meat. For, having stunned several beasts, he would then proceed to rip them open, and so prevent their going any further ; then kill them at his leisure and have a supply which would keep an indefinite length of time in the cold air of that altitude and in the absence of vultures and other thieves which would render such a method unprofitable in other parts of India. I do not say that this is necessarily so, but is merely a theory which seems the only possible explanation of the wolf's method in this particular case.

An interesting instance of the adaptation of an animal's breeding habits to the local climate in districts quite close to one another is shown by the Red Jungle Fowl in Burma. In the Lower Salween valley you will find the chicks hatched out by the first week in April and finding their food under the thick carpet of dead leaves ; thus they are well advanced and able to withstand the terrific downpour of the monsoon in May. In the dry zone of Burma, however, conditions are reversed. There the jungle is not so heavy and the dead leaves not so thick ; while the monsoon is reduced to a season of heavy, but helpful showers with but rarely a few consecutive hours of rain. These conditions foster the birth of a crowded insect life lasting till the dry season returns again. In such districts the jungle fowl do not hatch out till the rains are well begun, and

I have found incomplete clutches in late July. Thus a continuous supply of food is easily obtainable by the chicks, and they are able to fend for themselves when the season of scarcity returns, and they must scatter over a wider area to search for food.

Another, in fact, I might say "the other" common game bird of the Burma jungles is the Silver Pheasant or "Yit"; for the Chinese Francolin sticks to the more open slopes and bush country of the foot-hills, while peafowl are very local.

Both Jungle Fowl and "Yit" (as the Burmans call the silver pheasant) are snared in large numbers by tethering a tame cock bird of the species on top of some small mound in the jungle and surrounding him with horse-hair nooses. The tame bird then challenges the wild, who comes to do battle and is treacherously snared. Some of the decoy birds are extraordinarily successful and seem to take a delight in enticing their wild brethren to destruction; such birds are greatly valued by the Burmans, and occasionally change hands for sums of money up to sixty or seventy rupees apiece. One "Yit" was shown to me in the Papun district, which had been the principal agent in the catching of twenty-two of its species in a fortnight.

Burmans are wonderfully persevering in the pursuit of small beasts for food; the digging out of a Bamboo Rat or the pursuit of one of the big monitor lizards keeping them happily employed for hours. Occasionally you will see a couple of Burmans working the mud-flats surrounding a half-dried pond, one of them armed with a spade the other with a thin iron rod. This last the operator will thrust into the mud at intervals, and, on his getting the required "feel" at the end of it, his companion will dig there and eventually excavate a muddy lump which, on being washed, turns out to be a murrel. These fish are in the habit of aestivating in the mud and are excellent eating.

It always seems to me that we miss a lot of good things by our conservatism in the matter of what we eat. Strange fruits and vegetables we are fairly ready to try, but it is very hard to induce the average Briton to taste anything novel in the way of meat. Yet many unfamiliar animals are most excellent eating. Monkey and porcupine I can personally vouch for, and the big monitor lizards are closely akin to the Iguana, and probably just as savoury food as that South American delicacy. We eagerly devour snipe yet despise many shore birds such as the Black Godwit and Curlew, whose mode of life is more cleanly and which are just as good on the table. Very few birds can compare with a roast bittern in January; yet, when stationed in Peshawar in the vicinity of which cantonment they are comparatively common, I found very few sportsmen who did not pass them by in ignorance of their culinary virtues. One of the best eating birds in the East is the bustard of every species, but there is a curious superstition in connection with them which I have come across both in India and Somaliland. At certain seasons of the year the bustard tribe feed largely on the Cantharides beetle, and it is said that the man partaking of the flesh of their legs at that period, will become impotent. Why the poison should be contained in their legs only or whether there are any grounds whatever for the superstition I have failed to discover.

The Houbara has very curious means of defence which is usually to be seen in action when hawking them in Northern India. When the hawk is close to them, they drop to the ground and squat. Then on his coming within range they eject a sticky fluid (almost like birdlime) all over him, halfblinding him and so glueing his feathers together as to render the hawk incapable of proper flight. The houbara then rises in the air again and continues on its way rejoicing, while the hawker rides up and finds a bedraggled object looking like a badly made feather duster, sitting in impotent rage on the ground. The wary experienced hawk will draw the houbara's fire by feints, and then the latter's supply of birdlime becomes exhausted and the hawk goes in and finishes him.

One of the most thoroughly equipped animals for both attack and defence that I have come across, was a large black ant, three-quarters of an inch long, which was common in Somaliland. This insect was of stout build with very hard black casing, and carried an immense pair of nippers in front, with which he could inflict a most severe bite. In addition he used to emit when irritated an appalling odour, by reason of which he is generally known as the " corpse " ant. It used to be very amusing to see a couple of British officers earnestly engaged in inducing a " corpse " ant to quit their tent by guiding him gently with bits of twig so as to avoid the fetid result of annoying him.

To return to hawks. I sometimes used to ride down a hare on the Arori Plain in Somaliland, keeping on him till I killed him by striking him on the head with the short handle of a camel whip which I swung by the leather thong, or else he squatted so dead-beat that I could jump off my pony and pick him up. Twice when I had an exhausted hare in front of me, an eagle swooped down and made repeated attempts to deprive me of the fruits of the chase. Once I only succeeded in rescuing my dinner by riding over the pirate, actually hitting him with my whip as he rose under the pony's nose.

The Arori Plain was a great place for Secretary Birds, which used to give a weird display when killing a snake or lizard ; banging their prey with their wings, stamping on it violently, and giving one the impression at a distance that one was watching an unusually energetic war-dance by a Red Indian Brave.

The Hammer-head Storks, other queer denizens of the country, were wont to build a huge thatched nest of sticks in the top of some moderate sized tree. There was one in the top of a dead " guda " thorn tree close to one of my shooting camps, and watching the owners enter it was a source of unending interest. The nest was at least five feet in diameter and the eaves overhung the tunnel-like entrance which sloped up towards the centre. To enter this the bird would fly clumsily round two or three times until sufficient speed had been obtained ; then, approaching the entrance, it would suddenly close its wings and shoot up into it, the whole performance looking rather like a wind-blown umbrella suddenly collapsing and bolting up a rabbit hole.

A most impressive flying performance is often given by choughs in Baltistan in the spring. A small flock (of a dozen to fifteen as a rule) will circle up into the sky with loud ringing cries until they are mere speck against the blue. Then one after the other in rapid succession, they close their wings and drop like plummets at a dizzy speed till within a few feet of destruction on the rocks, then spread their wings again and sail up to perch happily together on the hill-side. This performance is gone through several times during the day, the object apparently being to show off their flying powers by as near an approach to destruction as possible.

A very delicate operation in the flying line is sometimes to be seen at the south end of the Tsokr Chumr lake in Ladakh. Here there are some broken rocky cliffs in which the Brahminy Ducks (or Ruddy Sheldrake) breed in large numbers. When the young are hatched the parents (or perhaps the female only) have to carry the young down to the lake. This they do by tucking them in between the neck and shoulder, and it is very interesting to watch an old duck start with short wing-strokes and then do a long vol-plane down to the shore, occasionally cocking her head round to see to the safety of her youngster. These ducks are sometimes found far from water and I once walked into a brood of fluffy ducklings of this species on the Kiangchu Plain, which is waterless except for a couple of small springs. These Brahminy, usually so wary in India, were much more confiding than the Bar-headed Geese which breed at the south end of the Tso Moriri lake. There I vainly tried in August 1911 to obtain a tender gosling for dinner, but found them much too alert.

There is a Kiangchu, or " wild horse water " here also, but it belies its name or I saw no Kiang there, but only a beautiful red fox, which I came on while he

was rolling in the sand of a dry watercourse. I was without a gun, so I was unable to secure him for the British Museum and have never yet been able to identify his species. The other Kiangchu, forty miles to the north-east, lived upto its name with a vengeance. There, on the occasion of my first stalk after Tibetan Gazelle in 1905, I was unfortunate enough to attract the attention by one of those inquisitive nuisances known as Kiang in the local vernacular and of other more expressive names to the sportsmen who have endured their vagaries. On this occasion the first individual, having conducted an independent investigation, then went off and fetched two of his friends to enjoy the sight of an angry man trying to hide behind a stone five sizes too small. Others came up and brought their pals till finally I had seventeen of them kicking up their heels and playing at circus behind me, so that the gazelle I was stalking gathered that there was something amiss and departed over the horizon. These coffin-headed brutes, half horse, half donkey, turn up and show off their beautiful trotting action (their only virtue amongst innumerable vices) in all sorts of out-of-the way places, and generally manage to arrive at the very moment best calculated to spoil a stalk. I had one or two stalks spoiled by wild asses in Somaliland, but they were not nearly so numerous as the Kiang is in Ladakh, of which latter I once collected twenty-three by the simple expedient of lying on the ground and waving my handkerchief, there being but one solitary specimen in sight when I began. I am glad to say that I never lost my temper quite so badly as to shoot one, as did one sportsman of my acquaintance with a Somali Wild Ass. At that time these animals were on the "protected" list and when asked by the authorities for an explanation of his crime, my friend stated that he had done it in self-defence, as the animal had kicked him!

"THE BIRDS OF MESOPOTAMIA."

BY

CLAUD B. TICEHURST, M.A., M.B.O.U., late Captain, R.A.M.C.

Assisted by

P. A. BUXTON, M.A., M.B.O.U., late Captain, R.A.M.C.

and

MAJOR R. E. CHEESMAN, M.B.O.U., 5th Buffs.

(With two plates.)

PREFACE.

During the late war a number of officers who were more or less interested in Ornithology found themselves in Mesopotamia, and thanks to the help and stimulus given by the Bombay Natural History Society, and especially by their Curator, Capt. N. B. Kinnear, considerable collections and observations were made, while Sir Percy Cox, the High Commissioner, gave great help in many ways.

It has been the aim of the Society to get together all the information available from the various members of the Force, and the collections they made, in order that as comprehensive a paper as possible on the Avifauna of Mesopotamia could be written for the use of present and future British residents in that country, and the Society has asked me to undertake the task of working out the collections and putting together this account, which I have had much pleasure in doing,—ably assisted by Major Cheesman and Capt. Buxton, without whose help this paper could not have been written.

The chief collections were formed by (1) Maj. Cheesman and Sir Percy Cox, (2) Capt. Pitman, (3) Capt. Buxton, while Major Ross, Lt.-Col. Bailey, Maj. Logan Home, Capt. Aldworth, Capt. Harrison, Capt. Armstrong, the writer and others contributed smaller numbers. The first two collections have been presented to the Bombay Natural History Society. Accompanying these collections were a number of observations and field notes, while others contributed also notes of varying amount and value. The list of contributors is as follows :—

Capt. T. P. Aldworth, D.S.O., 3rd W. Kent.
Capt. J. Armstrong, R.A.M.C.
Capt. R. Bignell.
Maj. Logan Home.
Capt. F. Ludlow.
Lt. A. St. G. Macdonald.

Lt.-Col. F. M. Bailey, C.I.E.
Maj.-Genl. Sir F. Brooking.
Capt. Burgess.
Capt. P. A. Buxton, R.A.M.C.
Maj. R. E. Cheesman, 5th Buffs.
Maj. J. Chrystal.
Lt.-Col. F. P. Connor, I.M.S.
Maj.-Genl. Sir Percy Cox, G.C.I.E., K.C.S.I.
Lt.-Genl. Sir R. Egerton.
Maj. Fleming, D.S.O., Trench Mortar Brig.
Capt. W. Graham, R.A.M.C.
Capt. L. Harrison, R.A.M.C.
Capt. Hedgecock, Pol. Dept.
Capt. R. W. G. Hingston, I.M.S.
Capt. R. Hobkirk, 1st Manchesters.
Lt. W. Hyatt.
Capt. C. M. Ingoldby, R.A.M.C.
Capt. T. R. Livesey, Pat. Lancers.
Maj.-Gen. H. D. Keary.
Lt.-Col. H. A. F. Magrath, 51st Sikhs.
The late Maj. G. A. Perreau.
H. St. J. Philby, Esq., C.I.E., Pol. Dept.
Capt. C. R. Pitman.
Capt. G. D. Robinson.
Maj. E. J. Ross.
Lt.-Col. Stevens.
Capt. H. F. Stoneham, O.B.E., 1st E. Surrey.
Capt. C. B. Ticehurst, R.A.M.C.
Lt.-Col. F. E. Venning.
Lt.-Col. F. Wall, C.M.G., I.M.S.
Maj. Wernicke.
Lt.-Col. Sir A. T. Wilson, C.S.I., C.I.E., D.S.O.
Maj. Wimshurst, 5th Buffs.
Lt.-Col. H. S. Wood, I.M.S.
Maj. Watts, 23rd Cavalry.

To all these gentlemen the thanks of the Society are due for their help and co-operation.

The area covered by this paper is roughly from Mosul to Fao and from the Jebel Hamrin range to the Syrio-Arabian desert, and although over this large area there are a considerable number of observations and collections from many places, these have naturally followed the lines of war's progression, and there are parts where it so happened no one of ornithological tastes happened to be, notably on the Euphrates from Nasiriyeh to Hilla and from Feluja to Hit, and again in the North on the line Khanikin-Kifri-Kirkuk-Mosul, little was done, while Major Cheesman and Capt. Aldworth were the only ones to visit the latter city. This paper therefore, is not and cannot be the last word on Mesopotamian Ornithology, but is intended to be a ground work and book of reference for future workers. Defects and omissions there are bound to be, but it must be remembered that these observations and collections were made during war and often under extremely trying circumstances.

In order to make this account as complete as possible for our area, I have included or referred to anything which has been written in the past on the subject, and a full bibliography (for which I am indebted to the Rev. F. C. R. Jourdain) is appended. During the war a few notes have appeared in the B. N. H. S. Journal and in the "*Field*;"

the latter were chiefly remarkable for the species the authors and no one else ever met with and some of them were, to say the least, highly improbable.

The working up of the notes of various observers has been no simple task ; many notes were made in the trenches, or at least under active service conditions where baggage was reduced to a minimum, and were therefore not presented in a manner which lent themselves to easy abstraction. Furthermore, as was to be expected, many observers saw species which were quite new to them and mistakes in their identification were inevitable. Fortunately the collections contained specimens of the great majority of the birds which are known to occur in our area and so in many cases I have been able to correct wrong identifications ; in other cases however, unless it is extremely probable or known that the species recorded does occur, in the absence of specimens I have omitted them or referred to them in the text. Names of places in the text mean the districts round those places.

In the letter-press it will be noted here and there that I have drawn attention to various points which require further elucidation, and it is to be hoped that any one who has the chance will make special efforts to throw light on the questions raised : I shall be at all times most willing to give any help or information to, or identify specimens for any one who cares to communicate with me, and I propose from time to time, as new facts accumulate, to add *addenda* and *corrigenda* to the Mesopotamian avifauna in the Journal.

Of each species I have given the English and Latin names and below these, as a trinomial, the names of the race or races of that species which I am satisfied occur in Mesopotamia ; I have also added, as I think it may be of use, the original references and type localities to all, except to those species of which some, but at present undetermined, race occurs. In some cases (*e.g.*, some Waders and Ducks, etc.) for economy of space only the binomial name is given ; either I have considered that no good races occur, or else are so remote from Mesopotamia that any but the typical race is unlikely to occur.

As regards the much vexed question of nomenclature it is now fairly widely agreed to start from the tenth edition of Linnæus, an ill advised procedure which for the time being has put nomenclature into a chaotic state ; even the names of our British species, on which perhaps more study and discussion has taken place than on those of any other area, are not yet finally and indisputably decided on, while in some faunal areas hardly any revision has as yet been attempted.

Therefore it is needless to say that there is no up-to-date list (will any list ever be correct according to the present rules of nomenclature for more than six months after publication ? !) which for our area we can follow. The hunting up of the latest published opinions, scattered throughout the ornithological literature of the world, on what various names should now be, entails more time than is at my disposal and if

accomplished would only produce a list which in a short time would be "out-of-date" again. However it is to be hoped that the nomenclature here used will at all events be understood by everyone and that after all is the only object of Latin nomenclature.

In working out the collections I am greatly indebted to the facilities given me by the authorities at the British Museum (Natural History) and especially to Mr. N. B. Kinnear for the assistance he has given me in many ways. My thanks are due to Captains P. A. Buxton and J. Armstrong for the use of their collections, to Mr. Jourdain for notes on Mesopotamian eggs in his collection and to Miss M. Shopland, Miss D. Smith and Mr. F. W. Smalley for kind help in typing the manuscript.

The total number of specimens from all sources available for examination is about 2,500 comprising 241 species out of the 330 species known to occur.

C. B. TICEHURST.

LOWESTOFT, ENGLAND,
March 1*st*, 1921.

INTRODUCTION.

1. GEOGRAPHY.—The Mesopotamian plain, by which we mean that part of Mesopotamia which, between Fao in the extreme south and Faish Gorge (where the Jebel Hamrin range crosses the Tigris north of Baghdad), lies between the latter range on the east and the edge of the Syrian desert on the west, is remarkable above all things for its uniformity, or as some might put it, its extreme monotony. As one passes from Fao up the Shatt-el-Arab, there is seen what at first looks like a forest of date palms bordering the river banks; but where here and there a peep beyond is obtained, one realizes the "forest" is only a belt of trees a few yards up to two miles wide beyond which seems limitless mud desert. The uniformity of the land is essentially due to geological causes; the whole area is rich alluvial soil and consists of very fine silt brought down through long ages from the highlands of Eastern Asia Minor, Armenia and N. W. Persia. Over the country this silt has been spread to a depth of hundreds of feet and it follows therefore that underlying rocks exercise no influence on either the fauna or the flora. The surface of this alluvial deposit is practically flat except where it has been disturbed by the hand of man. This flatness is so extreme that it must be seen to be realized, but we may mention that the altitude of Baghdad is 112 feet above sea level though its distance from the sea is 200 miles, and Samarra 420 miles from the coast is but 240 feet in elevation; were the Kew Sigwall to be erected at Fao the flag would float above the head of the entire Mesopotamian plain. On the very rough quarter inch maps, which were in use during the war, small mounds were marked and their heights relative to the plain, were it only three or four feet, were indicated.

Through this alluvial plain run the two great rivers, the Tigris and Euphrates, with their tributaries, e.g., the Karun in the south and the Diyala in the north, both loaded with silt at the time of the annual high water in the month of April. At this season the water of the rivers tends to overflow the whole country and much of it is led away over the surface of the ground for irrigation; most of the silt which it carries is deposited fairly near the rivers, and it therefore happens that the land nearest the river is generally very slightly higher than the land further from it. Long ago the waters of the Tigris entered the sea at a place

to-day marked by the ruins of the Median Wall between Beled and Samarra and now over 400 miles from the coast. The old estuary of the Euphrates would be about the same distance while that of the Karun was in the vicinity of Ahwaz. As the rivers raised the level of the delta, the sea was gradually forced back. In Assyrian times it is supposed to have reached Ur of the Chaldees on the Euphrates and to Amara on the Tigris ; since then it has receded another 180 miles to Fao. The rivers when in flood, still rise above the level of the whole area and are kept more or less in their course by artificial banks.

In many parts there is fertile soil right up to the river banks on which wheat and barley are grown, while the cultivatable area could by a scientific irrigation be enormously extended. In places where the cultivation has lapsed for many years, the river banks may become covered with an almost impenetrable jungle consisting of Acacia (*Prosopis stephania*) and Liquorice (*Glycerrhiza glabra*) waist high with bushes of Tamarisk (*Tamarix*), Poplar (*Populus euphratica*), Tea-tree (*Lycium europœum*) and Bramble (*Rubus. sp.*). Similar jungle grows on one or two islands, especially that at Kharadah below Baghdad. Close to the river where water is abundant date palms (*Phœnix dactylifera*) are cultivated over large areas ; there are also extensive vegetable gardens near towns which are planted with figs, apricots, peaches, apples, pomegranates, mulberries, limes and occasionally oranges.

In many parts of Mesopotamia, if one travels ten miles from the Tigris or Euphrates or one of the main effluent irrigation canals, one comes to parts which lie below the level of the corn land by a few feet. Such land is often temporary marsh and is quite dry and sunbaked by mid-summer. There is no boundary between these temporary marshes and the permanent ones, many of which contain huge areas of water which remains two to three feet deep all the year round, and grow crops of rushes and tall reeds ; such marshes are the Hor Hawaize, parts of the Hamar Lake and the swamp at Nejef, while these at Suweikieh and Akkakuf and many others partake of a more temporary character.

Certain areas are low-lying but have no natural drainage ; some of these patches are only a few acres in extent and are only " low-lying " by a few inches, others are much larger. In either case, flood and rain water accumulates here and evaporates, and gradually becomes salter and salter ; at some seasons they are quite white with a saline incrustation. Some of these patches are completely devoid of vegetation, in others the succulent bush (*Sueda monoica*) grows freely.

Parts of the Mesopotamian plain, which are beyond the present reach of water and so practically devoid of vegetation in the summer months, may be said to consist of bare flat mud desert, and no stones or gravel are found in the plain proper.

About 50 miles above Baghdad the aspect of the country changes somewhat and one leaves the plain proper at the Median Wall. At 120 miles from Baghdad, the Jebel Hamrin range crosses the Tigris which passes through the range at Fatah Gorge. Between here and Mosul (our limit in this paper) is an undulating plain (700 feet) of gravel and stones covered with grass in the spring, and here and there along the river are cliffs 100 feet or so in height, similar to those which are also found between Samarra and Tekrit. The ground now rises more quickly and alluvium gives place to lime stones, gypsum, gravel and rocks. Lying above the highest river level, the land cannot be irrigated ; a certain amount of " daim " or rain fed cultivation however, is carried on in the depressions where drought resisting wheat and barley are grown and obtain a small amount of water in addition to the actual rainfall from the shelving sides of the small hills. The low table land after winter rains is covered for a short period with grasses and flowers such as scabius, iris, delphinium and wild holly-hock, and is grazed over by the herds and flocks of roving tribes.

2. Climate.—The average annual rainfall is six inches, which is confined to the months of December to April. The shade temperature rises to 120 or more

n July, and in January twelve degrees of frost have been registered. On the whole, one may say that the climate from November to April is well nigh perfect, and from May to September the reverse. The Shumaal or north wind commences to blow about the end of May and continues into July ; it is welcomed as modifying the hot days but causes a certain amount of dust storm. Snow is not known in the plains but hail storms occur especially in spring. The tops of the Pusht-i-kuh Mountains hold snow till about May and are visible from the Tigris from Amara to Kut.

Tracing the Jebel Hamrin, a sandstone range, to the south-east, we find it forms a more or less continuous line of hills to Ahwaz and form as it were foothills to the great Pusht-i-kuh Mountains and also the eastern boundary of the Mesopotamian plain ; this range runs up to 700-800 feet, while the Pusht-i-kuh Mountains, which are outside our area, run up to about 9,000 feet. The latter, however, exert a certain amount of influence on our area as not a few of the winter visitors to the plains pass the summer there and in the high table land of Persia which is cooler and better supplied with vegetation. The Jebel Hamrin range depends for its beauty on its colouring and except for a short period in spring, it is destitute of vegetation. It is a rugged country of hills and vales and includes the oil-fields at Maidan-i-Naptun on the east of the Karun.

3. Divisions.—Although the Mesopotamian plain is so flat and uniform, it may, for purposes of zoo-geography and more particularly for the information of residents in the country, be divided into eight sub-divisions with three more outside the plains.

1. *The Seacoast and mud banks at the mouth of the Shat-al-Arab at Fao.*

A certain amount of information about the ornithology of this district was supplied by Mr. W. D. Cumming during his residence there in the eighties, but very little collecting was done there during the war and no description of the place has been given. There are enormous areas of swampy grass and mud banks more or less covered by high tide and probably many creeks and islets. In winter it is, of course, the happy hunting ground of vast numbers of Waders, Gulls, etc., while here the Pelican and Flamingo breed and the Reef Heron is resident. Of particular interest is the Khor Abdulla or Abdulla Banks. Armstrong, who while at Fao made enquiries concerning them, states that they are a group of rocks situated on the Arabian side of Fao and about 15 miles distant. They lie in an old channel of the Shat-al-Arab surrounded at low water by vast mud-banks, while between them there is a certain amount of silted mud and sand. It must be a big breeding ground certainly of the Crab Plover, while the Spoonbill, Pelican Reef Heron and perhaps other Herons are said to nest there. No Englishman has apparently visited them, except the Superintendent, Telegraphs, at Fao from whom this information is derived.†

2. *The edge of the Syrian and Arabian desert which lies on the right bank of the Euphrates and Shat-al-Arab.*

This consists of a sandy and gravelly table land gradually rising from 30 to 2,000 feet in altitude towards the centre of Arabia. This table land is very bare excepting in the spring and has very few birds ; on migration, however, a fair number of birds visit such oases as exist as at Shaiba. Here occur as typical denizens the Bifasciated Lark (*Alæmon*), the Finch Lark (*Pyrrhulauda*) and a Desert Lark (*Ammomanes*).

3. *Permanent marsh and reed areas, and temporary marsh.*

The Hamar Lake, Horr Sanef, Howaiza marsh are formed by the continuous overflow of the Euphrates, Tigris and Kerkha rivers into vast depressions just above tidal influence in the Kurna district are the most important of these in the south, and the Euphrates marshes round Museyib and the Nejef swamps in the middle of the plain. In winter, countless myriads of wildfowl immigrate here.

† Sir Percy Cox has visited these Rocks several times and the Society's Collection contains skins and eggs from there presented by Sir Percy. A note of these is being sent to Dr. Ticehurst : Eds :

The most frequently seen are Tufted Duck; the Grey Lag and White-fronted are the common geese, while the Heron tribe is very well represented with Goliath Purple, Common, Night and Squacco Herons, Bitterns, Little Bitterns, Egrets, Ibis, etc., and Coots, Purple Gallinule, etc., swarm. In summer it would seem to be ornithologically not so interesting. Buxton travelled by canoe twice for two days across the Hor Hawezeh in July, and saw comparatively few birds. For two days he passed through gigantic beds of reeds, many of them 18-20 feet high, intersected by narrow channels of clear water, six feet deep in places; there were no small birds in the reeds except close to land, where the Moustached Sedged Warbler was common, and the larger birds seemed to consist of nothing but Purple Coots, Pigmy Cormorants, Goliath Heron and Darters, but doubtless there were a few others such as Marsh Harrier and Purple Heron as in other lakes, and there is a certain amount of evidence that a few Grey Lag remain to breed, as certainly does the Marbled Duck, while in the Euphrates marshes around Museyib, the Avocet, Whiskered Tern and Black-necked Grebe, etc., nest.

Temporary lakes are frequently formed by the spill of the rivers in flood such as at the Umal Brahm and Akkarkuf, etc. These are large open sheets of water affording a haven in winter for water fowl and waders generally, but under the influence of the spring sun, dry up quickly and on the receding mud waste, Common and Lesser Terns, Kentish and Little Ringed Plover and White-tailed Lapwing breed in numbers; the Stilt on the more swampy parts.

4. *Date and Fruit Gardens.*

These are the haunts of the tree loving species to which in Mesopotamia, little alternative exists. Among the resident birds are the Wood Pigeon, Persian Crow, Indian Ringed Dove, Babbler and Bulbul, while the Indian Roller is restricted to the Shat-al-Arab area. In winter come the song Thrush, Persian Robin, Isabelline Shrike, *Phylloscopi*, etc., while the tall date palms are resorted to for roosting by countless Rooks, Starlings, Black Kites and Night Herons. In summer come to breed the Olivaceous Warbler, Nightingale, Grey-backed Warbler, Persian Turtle Dove and Yellow-throated Sparrow (*Gymnorhis*), etc., and many passage migrants halt here. One day every bush is full of *Phylloscopi*, another every pomegranate bush holds Woodchat or Red-backed Shrikes or the bean fields are full of Great Reed Warblers.

5. *The Corn Lands.*

In winter, this is the haunt of Rooks, Jackdaws, Stock and Rock doves which feed on the newly sewn corn; the Crested Lark is ubiquitous and resident; Sky, Wood and Short-toed Larks, House and Spanish Sparrows are to be seen in flocks in winter while the Pallid Harrier and Kestrel particularly affect this type of country. As the corn grows high, various migrants may here be found such as the Sedge Warbler, Lesser White-throat, etc. During irrigation in winter and early spring, numbers of Wagtails and Meadow, Water and Red-throated Pipits haunt the wettest parts.

In the summer, after harvest, the Large Pin-tailed Sandgrouse in immense numbers, and the Spotted Sand Grouse in small numbers breed in and round the corn lands.

6. *The Rivers and low Scrub Jungle along the banks.*

In winter, the White Wagtail, Green Plover, Green and Red Shanks and Common Sandpiper are among the familiar winter visitors, while the Common, Pied and White-breasted Kingfishers, Red-Wattled Lapwing are resident and breed. In winter too, many Gulls (*L. cachinnans* and *ridibundus*) may be seen far up the river inland, as well as Gull-billed, Little and Caspian Terns, while among the ducks, the Smew and Golden-eye seem to show a predelection for the rivers themselves.

In the scrub and scrub jungles which only exist in the vicinity of rivers and canals, the Black Partridge or Francolin is a characteristic bird, as also are Menetries Warbler, Streaked Wren Warbler, and here and there (as a summer visitor) the Grey Hypocolius and Scrub Sparrow, while in winter, these last are joined

at roost by hordes of Spanish Sparrow. Here, too, in winter may be seen Blue Throats, Robins, Black Redstarts, etc., and the few Finches which occur, such as the Goldfinch, Chaffinch, Eastern Linnet and rarer still the Red-fronted Finch (*Metaponia*) and Crimson-winged Bullfinch (*Rhodospiza*).

7. *Uncultivated land beyond the irrigated area.*

The dwellers in this desolate region are few; MacQueen's Bustard breeds there while the Norfolk Plover and Cream-coloured Courser have been seen in the breeding season in pairs, and almost certainly breed. Here, too, may be found the Pratincole in colonies, while the Blue-cheeked Bee-eater makes its burrows into the flat surface, choosing places with a sandy subsoil. In winter a few Eagles Long-legged Buzzards, odd Isabelline and other Wheatears and occasionally the Desert Warbler are almost the sole occupants to be seen on a long day's journey.

8. *Towns and Buildings.*

The House Sparrow must take premier place and is a resident everywhere. The White Stork nests on the houses and mosques in Baghdad and northwards. The Barn Owl is a local resident, while the Kestrel and probably also the Lesses Kestrel utilize suitable buildings. The Eastern Swift (*C. murinus*) breeds in most of the larger towns. The Swallows are summer visitors and breed in most of the houses, while their nests built on the tent poles were an annual feature of the canvas camps. The Rock Dove inhabits the towns and ruins, such as at Ctesiphon, in numbers, and enjoys an immunity from persecution from the Mahomedans by living in the sacred mosques; the flocks of unmixed blue are one of the beauties of Baghdad and it is hoped it will be long before the nondescript breeds of the fancier appear and convert them into the mongrel pigeon communities usually seen.

This concludes the subdivisions of the great alluvial plain; above this and always above the highest level of the rivers we have :—

1. *Undulating table land.*—Here on the rolling plains of gravel and grass such as between Fatah Gorge and Mosul, the Calandra and Short-toed Larks which spread out in winter to lower parts, retire to nest; in suitable spots the Desert Lark (*Ammomanes*) is resident. In the cliffs where the river has cut its way through the hills of conglomerate rocks, Bonelli's Eagle, Long-Legged Buzaard, Egyptian Vulture and Raven breed. The See-See (*Ammoperdix*) is not uncommon on the rougher ground, and is, of course, resident..

Here, too, is one of the breeding places of the Brahminy Duck. On the vast grassy plains, the Great Bustard is to be met with round Kirkuk and Mosul and was not uncommon when these places were first occupied.

Correspondingly similar places are to be found at Shahroban on the Diala, at Ahwaz on the Karun, and somewhere above Feluja on the Euphrates.

2. *Foothills of the mountains* 900—1,500 *feet from Mosul to Ahwaz*—Cheesman and Buxton were about the only observers who visited these rugged hills and they found very few species there but as might be expected a few species occur there which are not found elsewhere, the Red-rumped Swallow and Rock Nuthatch were apparently resident as also is the Chukar in suitable places, while Hume's Chat was also obtained here. The Pusht-i-kuh Mountains are outside our area; they include the Zagros referred to by Zarudny.

P. A. B.
R. E. C.

4. Migration—A feature of the avifauna of Mesopotamia is the small number of resident species in contrast to a long list of migrants and winter visitors. In fact one might mention places where there is but one resident—the crested lark. During the spring and autumn migrations, even these desolate spots are thronged with bird life undertaking the great pilgrimage, either staying a while to rest or feed, or merely passing over. The small oasis, such as Shaiba, on the edge of

the Syrian and Arabian deserts, provide more favourable opportunity for bird migration study than would a much frequented island in mid-ocean, to which the oasis in a reverse sense corresponds. The few tall tamarisk or palm trees can be seen for long distances across the thirsty sand-waste and promise shade and a refresher at the wells. Here taking advantage of the scantiest vegetation or shelter, the most unexpected species in such a region were encountered, as land-rails, moorhen and the nightingale ; next day these had departed, their place being taken by wagtails, flycatchers, cuckoo, blackcap and white-thoat, and so in even changing procession until the last one had passed and the small plantation settles down to its normal aspect—the home of a pair or two of crested larks.

Mesopotamia lies in one of the great migration routes of the Palæarctic birds (a geographical division of the bird kingdom to which the English birds also belong). This division roughly comprises Europe and N. Asia. The Southern boundary line passes along the Persian coast and at Fao strikes across the Syrian desert to the Gulf of Akaba. Most of Arabia at all events, is in the Ethiopian or African region.*

Palmen suggested several routes by which most Palæarctic birds travel to and from their summer quarters. It is only necessary to give one here, but as a matter of interest we will include route A which " leaving the Siberian shores of the Polar Sea passes down the west coast of Norway to the North Sea and the British Isles " thence through France and Spain to Africa, in some cases far south in Africa. The route affecting this paper is route D, Starting from the extreme north of Siberia it ascends the river Ob and branches out near Tobolsk, one track diverging to the Volga, descends that river and so passes to the sea of Azov, the Black Sea and thence by the Bosphorus and Aegean to Egypt ; another track makes for the Caspian by way of the Ural river and so leads to the Persian Gulf. The latter branch is that which passed twice a year over the Mesopotamian Expeditionary Force, mostly following the line of the three large rivers, Tigris, Euphrates and Karun, though doubtless many birds also make their way through the valley and passes of the mountains of Kurdistan and Luristan.

During the war, our stay in any one locality was always brief, our own migrations were frequent and time was occupied in other directions and so our knowledge of migration is too scanty to do more than roughly indicate what possibly happens. However our observations at the oasis of Shaiba led us to believe that these birds which leave Mesopotamia for the winter pass on into Arabia and most of them presumably cross the Red Sea to find winter quarters in Africa. The centre of Arabia is unfortunately terra *incognita* ornithologically. The normal autumn migration at Shaiba was moving in a south to south-west direction and if these courses were held they must either go straight across Arabia or possibly strike the Persian Gulf somewhere near Koweit and perhaps coast along before striking across this continent. An exception to this general direction was noticed at Shaiba in the case of the yellow wagtails, flocks of which were seen on several consecutive days flying low over the desert in a *North-easterly* direction which would bring them to the Shat-al-Arab near Busra. The only explanations of this

* Where one should draw the boundary of the Palæarctic and Ethiopian regions cannot be determined as yet, until the fauna of Central Arabia is known and that of the Arbian shore of the Persian Gulf. Palestine, in spite of its few Ethiopian forms must certainly be considered Palæarctic and so must Sinai ; Hedjaz and Yemen on the other hand partake of an Ethiopian character. Mr. H. St. J. Philby, C.I.E., who has recently visited the Washm Province of Central Arabia informs me that he met with a grey Partridge there, probably *Francolinus pondicerianus*, an exceedingly interesting fact, as hitherto it was only known from Mascat in the Arabian continent. Mr. Philby knows the Black Partridge and See-See well and is quite certain his birds were not these.—C.B.T.

would seem to be that having " made " the oasis of Shaiba and found nothing but limitless bare desert beyond, they had decided to make the river again and coast on up the Gulf and cross inland elsewhere.

Besides the general north to south, south to north migrations there must be, we think, with some species, an east and west migration and *vice versa*, by which such species as the Blackheaded Bunting and Rosy Pastor reach their breeding grounds but details of this we know little of. There are, of course, too many local migrations as with the Pintailed Sand Grouse, which probably are influenced by food supply, and those of the Gullsand Terns moving to their breeding grounds.

It should not be inferred, of course, that the majority of birds make the complete journey from the far north through Mesopotamia to Africa ; comparatively few attempt this, and our migrants may be roughly grouped into the following divisions :—

A. There are some which breed in the far north and in winter come no further south than the Caspian ; as example of this is the Redwing.

B. Others nesting north of Persia come further south and winter in Mesopotamia such as many of the ducks and waders, some of the Pipits, the Short-eared Owl, Siberian Chiffchaff, and Dark-backed Herring Gull.

C. Others nesting north of Persia are passage migrants through Mesopotamia and winter in Africa such as many of the Cuckoos, Swallows, Warblers, Wagtails.

D. Another group nesting in Persia merely descend to the Mesopotamian plains to winter, among them are the Imperial Sand Grouse,Wheatears of several species, Persian Robins, Sharpe's Crow, Black Kite, Griffon, Vulture, etc.

E. Another group are summer visitors to Mesopotamia and go in some cases hardly north of this, and winter in Africa, such as the Blue-cheeked Bee-eater.

R. E. C.

5. Character of the Avifauna—This is undoubtedly Palæarctic, the majority of the breeding species belonging to Palæarctic *genera*, such as *Ædon, Hypolais, Sylvia, Passer, Pica, Acrocephalus, Melanocorypha,* etc., but a few Indian species have spread west along the Persian Gulf as far as Mesopotamia, such as *Coracias benghalensis, Pycnonotus leucotis, Prinia lepida, Porphyrio poliocephalus, Gymnorhis flavicollis, Sarcogrammus indicus, Gallinula c. parvifrons.* In winter and on the migrations, Mesopotamia is the meeting ground of East and West ; thus we may find *Phylloscopus collybita, tristis,* and *trochilus* all frequenting the same bushes; *Calandrella minor minor* and *m. heinei* associating in the same flock ; *Phœnicurus phœnicurus* and *ph. mesoleuca ; P. ochruros* with *phœnicuroides ; Saxicola r. rubicola* with *maura ; Turdus merula syriacus* with *intermedius ;* while *Streptopelia turtur arenicola* comes to breed, *S. t. turtur* is a passage migrant through the country. So too one finds different races passing through to reach their different breeding grounds in the north, such as *Motacilla f. thunbergi* in the far north, *campestris* and *dombrowskyi* to further south of this and so on. Here too in Mesopotamia probably is the meeting ground, roughly speaking, of the breeding areas of some closely allied races, as of the Blue Rock Thrush, See-See, Little Owl, Swallow, etc., but details of this cannot yet be worked out.

On the other hand Africa supplies a few birds such as *Th. æthiopicus, Plotus rufus, Ceryle rudis* while *Phyrrhulauda frontalis, Dromas ardeola, Alæmon alaudipes, Podiceps capensis* and *Pterocles lichtensteini* are Indo-African species.

Of widely distributed species it will be found generally that it is an eastern race which visits Mesopotamia in winter and on passage, and besides receiving migrants from Persia and the far north many must come from far more eastwards

such as *Alauda dulcivox, Anthus s. blakistoni, Calandrella m. heinei, Caprimulgus e. zarudnyi, Falcoœ. pallidus,* etc., while there is no definite evidence of any coming from the far north-west.

As one might expect from the character of the country some genera and families are well represented while others are not, thus the Gulls, Terns and Waders are to the fore, as also are the desert birds, while Shrikes, Larks and Wheatears can claim at least eight forms each ; Woodpeckers, Creepers, Tree Nut-hatches are as to be expected quite absent and of the Tits one species is found in one corner only and another (*Anthoscopus*) is a rare visitor. It is somewhat curious considering the abundant food supply during the war that Vultures should be so scarce ; only two species occur with any regularity and then not commonly.

Part of Mesopotamia has, of course, only emerged from the sea within historical times as already explained, but it is somewhat remarkable that so few forms have segregated out into recognizable geographical races more or less peculiar to the country and it shews what a long period of colonization is necessary sometimes for differentiation to take place, thus the *Prinia, Pica, Sarcogrammus Porphyrio, Alœmon, Crateropus caudatus, Coracias benghalensis* and probably the *Cisticola* are in no way differentiated from the Indo-Baluchi forms, while the *Ammomanes, Passer domesticus* and *Passer moabiticus* are in no way separable from the Palestine forms. Of European forms we have *Sterna minuta, Hirundo rustica, Riparia riparia, Ægialitis curonica* and *alexandrinus* and *Hypolais, elœica* but most of these are of wide distribution and great migrants. So far as we know, the only species which have segregated out into recognisable races are *Ammoperdix griseogularis, Francolinus vulgaris, Corvus capellanus, Alectoris græca* and *Pycnonotus leucotis,* but the last two are not entirely confined to Mesopotamia, while the only *species* entirely peculiar to the country are *Acrocephalus babylonicus* and *Crateropus altirostris.*

Altogether one may say that Mesopotamia has an avifauna of peculiar interest, and that in spite of the opinion of some, in few places does the study of geographical races tend to throw so great a light on the components of an avifauna as here. Is it of no interest to know whence the migrants come and from what direction these plains have received their now resident species?

Two districts call for special comment ; Urfa in the far north-west and the Karun district in the south-east. I have included all species noted at Urfa by Weigold for comparison, though it is beyond the area proper dealt with in this paper, and it is of interest as shewing apparently the western limit of some species on passage, such as the Wood and Bonelli's Warblers, the Collared Flycatcher, etc. and, taking the determinations of his racial forms to be correct, the western limit of some races which in our area are represented by more eastern races ; as these are fully noted in the letter-press they need not be detailed here.

As regards the Karun district we have only the bare statements of Zarudny concerning the status of the various species found there ; these I have alluded to where necessary, but it is to be noted that in many cases the status he gives does not agree with those given by our observers in lower Mesopotamia, in that he frequently records a species as a winter visitor of which we have no records in winter at all. Future investigation is necessary to shew whether some of the these, which otherwise are not known to winter north of Africa do find the Karun district tempting enough to stay their passage further south or not. Several other species are included on the strength of Zarudny's records alone, not having been so far met with elsewhere ; I do not of course vouch for Zarudny's statements.

It may perhaps be of some interest to give a list shewing the approximate status of the species in each order ; our present knowledge does not admit of an exact list and of course some species might be placed in more than one category.

I have placed each species in what appears to be the predominant category and only one race where more than one occurs is included.

	Res.	W. Vis.	Sum. Vis.	Pass Mig.	Strag.	St. incog.
Passeres	24	43	9	40	3	14
Piciform	4	..	3	6	1	4
Strigiform	4	2	..	..	..	1
Accipitriform ..	5	15	1	3	2	5
Palecaniform ..	2	1	..	..	..	2
Anseres	3	17	..	1	2	..
Phœnicopteriform..	1	..	..	..	..	..
Ardeiform	6	3	..	..	1	7
Gruiform	..	2	..	..	..	..
Charadriform ..	10	28	2	2	2	7
Lariform	6	6	2	..	..	2
Podicipiform ..	2	1	..	..	..	..
Ralliform	3	3	..	2	..	..
Columbiform ..	3	1	1	..	1	..
Pterocleiiform ..	2	1	..	..	..	1
Galliform	3	..	..	1	..	..
	78	123	18	55	12	43

C. B. T.

1. Raven. Corvus corax.

Corvus corax laurencei, Hume (Lahore to Yarkhand, p. 335, 1873—Punjab).

The Raven is at the most a local migrant in Mesopotamia. It is fairly common and nests in the Jebel Hamrin range from Ahwaz in the south to at least Baiji, and probably further, in the north; it also breeds on the river cliffs of the Adhaim and the Tigris from Samarra to Baiji. Logan Hume noted it building at Tekrit at the end of January and Aldworth found nests of seven and three eggs in the first week of March at the same place; Cheesman saw young being fed in the nest on April 18th at Baiji.

In winter the Raven wanders out into the plains but is only found apparently at such places where the hills are no great distance away.

Thus there are no records from the Euphrates and none from the Tigris south of Ali Gharbi, at which place the hills are only some 15 miles distant. Here and at Sheik Saad it is fairly common in winter frequenting in pairs the old battle fields, at Kut it is scarce and from Kut to some way north of Baghdad it appears to be absent, this stretch of the river being 60 miles or more from the hills.

Four specimens examined: ♀, Sheik Saad, 22-12-16; Baiji, 18-4-19 (P.Z.C. and R.E.C.). ♂ ♀, Ali Gharbi, 14-11-17 (P.A.B.).

The Mesopotamian birds agree well with the Indian ones, wings 427-440 mm.; bill 71-80, greatest height 27-29·5 mm.

In worn plumage they become very brown and might be mistaken for *C. ruficollis*.

Weigold records this race also from Urfa and Zarudny from the Karun district.

[The only record of *C. ruficollis*, the Brown-necked Raven, is that of a skin in the B. M. labelled Mesopotamia from either Loftus or the Euphrates Expedition. Mr. Kinnear, who kindly hunted up this skin and examined it for me, says that it is a very worn specimen of *laurencei*. Statements received concerning the occurrence of this species require verification and until specimens are forthcoming I include it in square brackets.]

2. Hooded Crow. Corvus cornix. "Ghrabi."

1. *Corvus cornix sharpii*, Oates (Fauna Brit. India Birds, 1, p. 20, 1889—Siberia).
2. *Corvus cornix capellanus*, Sclater (P.Z.S., Lond., 1876, p. 694, tab. LXVI—Head of Persian Gulf).

(1) Sharpe's Crow is a winter visitor to the Mesopotamian plains from the Persian highlands; its time of arrival and departure were not reported on and, as by some observers this bird was mixed up with the resident bird it is somewhat difficult to elucidate its distribution. It has been noted at Shush and on the Karun and Kerkha rivers in March by Woosnam and is recorded as a winter visitor in this area by Zarudny and at Basra by Tomlinson; but most observers agree it is a rarer bird everywhere than *capellanus* particularly so in the lower parts of the plain; thus Buxton met with it but seldom at Amara and it was apparently not common at Nasariyeh. Round Baghdad however it is plentiful and is reported from the Euphrates as far north as Ramadi, but on the Tigris there are no records north of Baghdad except from near Shahroban. Weigold records that a crow nests at Urfa, near the Syrian boundary, which, he says, is somewhat dark for *sharpii* but paler than *cornix*. This crow joins up with the flocks of the resident bird in winter.

(2) I am inclined to regard the resident crow of the Mesopotamian plains as a subspecies of the Hooded Crow and not as a separate species as it clearly replaces *sharpii* as the breeding crow of the plains, whereas the latter is also clearly the breeding bird of the Persian highlands.

The Mesopotamian Crow is resident throughout the year and its distribution would appear to be practically that of the date palm.

It is found from Fao up the Karun river to Ahwaz, Dizful, Shuster, Bund-i-kir and down towards Bushire; but Woosnam noted that as soon as the plains were left behind its place was taken by *sharpii*.

Passing up the Tigris it is common wherever there are palms to Baghdad and up the Euphrates to Museyib, beyond which town it seems to be scarce as Pitman only knew of one pair at Feluja. North of Baghdad on the Tigris it is said to be common in the gardens on the Diala river and near Sindia and it is not uncommon as far north as Samarra and Tekrit, beyond which there are no

records. Weigold does not include it for Urfa, nor Meinerzhagen and Sassi for Mosul.

This Crow is an early breeder ; Cumming says it breeds at Fao from February 15th to March 31st and Tomlinson found eggs on March 4th, and Aldworth several nests in the Nasariyeh district in the first week of March. The top of a tall date palm would appear to be the almost universal site, but Logan Home noted a nest at Amara in a low willow tree about 15 feet from the ground. The full number of eggs is 4 to 5. A nest examined by Buxton was a very untidy affair built of camel thorn and lined with sheeps wool and old paper. Mr. Jourdain informs me that the average of 43 eggs in his collection is 44·05×29·22 mm., and maximum 49·5×29·2 and 48×31·3 ; minimum 42·1×28·6 and 41·1×27·6 mm. ; there is considerable variation in size and some would pass for Raven's eggs while others are no larger than Rook's.

Their habits would seem to be much like those of Crows elsewhere, and they are very fond of marshes and the vicinity of human habitation, doubtless for what they can pick up ; Pitman notes that they are inveterate egg thieves, and will drive Rooks off any morsel they covet ; in absence of any better perch they will alight on tall reeds to which they cling like ungainly huge Reed warblers ! Their note struck me as being harsher than that of the European Hooded Crow, and they have another deeper and gruffer note which I do not remember in the latter bird.

In worn plumage the mantle of the Crow is a creamy white and the newly moulted feathers are very pale grey.

(1) , Amara, 30-1-18 ; Baghdad, 13-12-18 (P. Z. C. and R. E. C.).

(2) Five specimens examined : Akkarkuf, 2-8-17 ; 25-7-17 (P. A. B.); ♀, Basra, 12-5-17 ; ♀, Mohommerah, 29-3-17. (♀, Amara, 21-1-18. (P.Z.C. and R.E.C.)

This has the same wing formula as *cornix* 2nd primary between 6th and 7th, the 1st between 9th and 10th. *Scapulatus*, I may note, has quite a different wing to the *cornix* group, a much shorter 6th primary so that the 2nd is between the 5th and 6th and 1st equals the 8th.

Besides being noticeably paler than *sharpii*, *capellanus* has a larger bill and stouter feet.

3 Rook. Corvus frugilegus.

Corvus frugilegus, L. (Syst. Nat. Ed. X, p. 105, 1758—Sweden).

The Rook is an exceeding common winter visitor to the plains of Mesopotamia arriving with great regularity during the third week of October and continuing to arrive till the middle of November.

Its distribution is much influenced by the presence or absence of trees and cultivation, but it may be said that in suitable places it occurs from Mosul on the Tigris, and Ramadi on the Euphrates in the north, to Fao and the Karun district in the south.

The huge flights to and from their roosting quarters, evening and morning, at some places such as Basra, Amara, and Kazimain must have struck the least ornithologically observant.

In some gardens they roost in such masses that their droppings constitute an annual top dressing much appreciated by the more intelligent land-owners. Flying in to roost, at a fair height as a rule, a strong wind adversely affects them, and Buxton noted that under such conditions they start to come in much earlier and finish later, while they fly close above the ground.

Though a few depart as early as mid February the main migration does not begin till mid March and continues on through that month till the end of April, by which time all have gone. The direction is mostly north in spring and south or south-east in autumn.

Whether any Rooks breed regularly in Mesopotamia is doubtful, but Aldworth in 1919 found an isolated colony at Mosul.

Nine specimens examined : Amara, 10-12-17, 30-1-18, 17-2-18, 29-11-17, 13-1-18 (P. A. B.) ; ♂, Bagdad, 24-12-18 (two) ; ♂, Sheik Saad, 22-3-17. (P. Z. C. and R. E. C.) ; Samarra, 28-2-18 (C. R. P.).

I have compared these with a series of European birds and a series of Eastern ones (India, Turkestan, etc.), the so-called *tschusii* of Hartert, and I must confess that I can see no constant difference between any of them and I am again led to the conclusion as before (*see* Ibis, 1916, p. 41) that the differences are not constant enough to warrant the separation of *tschusii*.

4. Jackdaw. Corvus monedula.

Corvus monedula collaris, Drummond (Ann. and Mag. Nat. Hist. XVIII, p. 11, 1846—Macedonia).

There is not much on record concerning the Jackdaw in Mesopotamia.

According to Logan Home it is resident and breeds in the high cliffs in fair numbers below Tekrit, where he saw them building at the end of February and evidently nesting early in May. Ludlow noted them entering holes in cliffs at Khan Bagdadi in April, and they breed at Hit. Cheesman saw them at Tekrit on April 19th feeding on young locusts, but does not mention anything as regards nesting.

Meinertzhagen records large flocks at Mosul in winter. Elsewhere a few are occasionally met with amongst rooks in winter as at Amara, Kut, and Baghdad. Buxton found it to be common in November on the Jebel Hamrin near Shahroban. South of Amara there are no records but it nests in the Zagros Mountains and Persian highlands. Weigold met with it twice in April in the Urfa district.

One specimen examined : Shah Roban, 22-11-18 (P. A. B.).

The white neck band is very variable and in birds of one year old it is only indicated as a spot on each side of the neck, little more than is found in some specimens of the typical race.

5. Magpie. Pica pica. "Aq Aq"

Pica pica bactriana, Bp. (Consp. Av. 1, p. 383, 1850—East Persia).

The distribution of the Magpie in Mesopotamia is rather curious ; starting at Hilla on the Euphrates it is common and resident wherever there are suitable gardens and date groves, as far north at all events as Ana, where they are numerous ; round Baghdad it occurs but sparingly, and below the city on the Tigris it is absent ; on the Diala river it is found at Bakuba, Shahroban and Kizil Robat.

The Samarra-Tekrit area is unsuited to it but it is found again at Mosul. Wherever it occurs it probably breeds ; Pitman records it breeding at Feluja on March 15th and young in the nest were found there on April 28th ; at Museyib it was one of the commonest garden birds, many young ones being seen in June.

Three specimens examined :Hilla, 16-3-19 (two) (P. Z. C. and R. E. C.); Museyib, 12-7-17 (C. R. P.).

These have a very distinct white rump band and the black on the primaries very restricted, the only specimen with a perfect wing, a male, measured 210 mm. These birds exactly match specimens from Shiraz and are undoubtedly *bactriana*. Neumann records the typical race from Ras-el-ain near the Syrian boundary, whence I have seen no specimens.

(Capt. Burke says the Chough inhabits the cliffs in Kurdistan and is eaten by the Kurds as food ! It might wander down to the foot hills in our area in winter.)

6. Starling. Sturnus vulgaris. "Beiji."

(1) *Sturnus vulgaris vulgaris*, L. (Syst. Nat. Ed. X., p. 167, 1758—Sweden).

(2) *Sturnus vulgaris caucasicus*, Lorenz. (Beitr. Orn. Faun. Caucas., p. 9, 1887—Kislowodsk).

(3) *Sturnus vulgaris nobilior,* Hume (Stray Feathers, 1879, p. 175—Kandahar).
(4) *Sturnus vulgaris* subsp. ?
(5) *Sturnus vulgaris poltaratskyi,* Finsch. (P. Z. S., London, 1878, p. 713—L. Marka-Kul. Altai).

The Starling is an exceedingly abundant winter visitor to the plains arriving pretty regularly in the last days of October (earliest record 16th), and continuing to arrive throughout most of November. Thus Pitman noted flocks going S. and S. E. on most mornings up to the 24th of the month in the Adhaim-Samarra area, and Cheesman saw flocks passing over Sheik Saad on November 9th . Many move off again by the end of February, and in the first part of March they are quite scarce ; there are several records of small flocks moving north during the early part of this month and the latest date of any seen is the 23rd.

They are of course most abundant where food supply is plentiful, such as round camps, mule lines, transport dumps, etc., and they have their regular feeding and roosting places, the morning and evening flight between the two places being one of the noticeable ornithological features at Basra and elsewhere. Prodigious flocks are to be seen at times ; Evans records a flock exceeding 10,000 birds collecting at dusk near Amara. Hobkirk informs me that the Starling is as elsewhere a good imitator and he has heard it copying the note of the Pintailed Sand-grouse exactly.

Many Starlings found their way into the pot during the seige of Kut and elsewhere during the war, and Cheesman relates an amusing story thereon. At Sheik Saad on one occasion when cartridges were at a premium, a shot " into the brown " brought down a dozen which were secretly handed to the cook. The word was given out to the Mess that a *Quail pie* was provided for dinner with loud acclamation ; unfortunately however on serving, the heads and bills were found protruding and the provider hastily changed his diagnosis to *Snipe pudding,* hoping all would be well ! all partook of the dish without demur, save the O. C., who said he had never eaten *Woodpeckers* yet and he was not going to begin now !!

Thirty-five specimens examined :

(1) Amara, 15-2-18, 3-4-18, 7-11-1 (two), 15-2-18 (three), 4-12-17, 27-1-18 (P. A. B.); Basra, 19-12-18 (Armstrong); Samarra, 4-12-17, 21-12-17 (three); Kut, 4-1-17, 25-11-16 (C. R. P.); Sheik Saad, 13-12-16, 3-3-17 (P. Z. C.) and R. E. C.) ; Suleimania, 12-11-19 (Ross); Shustar, 3-2-18 (F. M. B.) ; Basra, 21-11-17 (five) (C. B. T.).
(2) Amara, 26-2-18 (P. A. B.) ; Amara, 15-2-18, 4-2-18 (P. Z. C. and R. E. C.) ; S. Saad, 18-12-17 (Robinson).
(3) Shaik Saad, 23-12-17, 20-12-17 (Robinson); Kut n. d. (Keary).
(4) ♂ Amara, 26-2-18 (P. A. B.); Shustar, 3-2-18 (F. M. B.).

(1) It is evident from the above numbers that *vulgaris* is far the commonest Starling of Mesopotamia. An east-Russian form has been described—*sophiæ* of Bianchi (=*jitkowi,* Buturlin) differing from the typical race by having more purplish colour on crown and throat and it is this form which has been recorded in winter in the Talysh, Palestine, Egypt, etc. (Hartert Novit. Zool. 25, p. 329) and which might be expected to occur in Mesopotamia. I have examined a very large number of these eastern Starlings and a great many Starlings from western Europe, and in my opinion the differences are too trivial and *far too inconstant* to warrant the separation of *sophiæ.* A great many English Starlings have purple heads and *not green* ones, and several breeding Swedish birds (topo-types of *vulgaris vulgaris*) have *purple* heads, while two birds from Moscow and Voronesh, which should have purple heads, have green ones ! I believe that the older and more worn the typical race becomes, the greener is the head. I can find no constant difference between the two. This " race " *sophiæ* extends as far east as Shiraz in winter.

(2) *caucasicus* is of course a very recognizable race with the red purple wing-coverts and green head, throat, mantle, and undertail coverts, when quite typical; however as with other races it is a little variable and I have examined two from the type locality (breeding) which had the throat purplish and one with purplish violet under-tail coverts. The crown however is invariably dark green.

(3) These three skins are quite inseparable from typical *nobilior* from Kandahar, differing from *caucasicus* in having the head, throat, and undertail coverts purple.

(4) These two birds are very puzzling and agree with no race of which I have been able to see descriptions of specimens of. There are two other skins, which evidently belong to the same race, collected by Mr. Hotson near Shiraz. These four specimens differ from *caucasicus* in having a *bright, vivid green gloss* on the wing-coverts, mixed with violet-blue, instead of a purple red gloss; also the upper parts from mantle to rump have a varying amount of purple sheen mixed with the green, so much so that an adult male from near Shiraz has the whole of the upper part bright purple *and no green gloss* at all. All four skins are winter specimens. As the breeding quarters of this bird are not known and some races have been described by the Russians, the descriptions of which I have not been able to see, I shall not compete with them in making another new race! Dr. Hartert who kindly examined these skins for me says they are "only *caucasicus* in their usual garb," though he admits one has far more purple on the back than usual. With this I must, I fear, disagree. I have examined about a score of typical *caucasicus* and all have the plum-red wing-coverts, utterly different to those in these birds; had there been *one* bird alone which differed from typical *caucasicus*, one might have put it down as an aberration, but with four skins all shewing the same differentiating characters one cannot help supposing that they belong to some other race.

(5) One obtained by Cheesman from a flock at Bagdad on November 21st, 1920, clearly belongs to this race. Perhaps not uncommon.

This does not exhaust the races of Starling which have been *recorded* from Mesopotamia! Meinerzhagen (Ibis 1914, p. 389) *saw purpurascens* in abundance! It may of course occur, but none of our thirty-five skins are referable to this race, and one cannot tell it in the field; such "records" are better left unpublished. Neumann (J. F. O., 1915, p. 121) described a new race from Northern Mesopotamia which he calls *oppenheimi*, and remarks that it does not fit in with any race according to Buturlin's key! He says it breeds in Mesopotamia as Dr. Pietschmann obtained on May 23rd at Mosul a grey, scarcely fledged, young one. Now Neumann's type came from Tel-Halaf (Ras-el-Ain) (between Mosul and the Syrian boundary) in *January* and he has seen a similar bird from Mosul, also in January (recorded by Sassi as *nobilior*), but how he arrives at the conclusion that his new race *breeds* there is beyond my comprehension, especially as the only breeding birds he has seen from this area, and which he describes, do not at all fit in with his diagnosis of *oppenheimi*! What exactly *oppenheimi* is, it is impossible to say without seeing the type and, until a series of breeding birds can be seen from Mosul to ascertain whether a distinct race *does* breed there, it is best, I think, not to recognize Neumann's race. From his description it is very close to *purpurascens* which breeds in Asia Minor and Armenia. Hartert states (Nov. Zool. 25, p. 332) that he has seen a Starling from south Mesopotamia which agreed with Neuman's description.

7. Rosy Pastor. Pastor roseus.

Pastor roseus (L.) (Syst. Nat. Ed. X, p. 170—Lappland).

The migrations of the Rosy Pastor would seem to avoid for the most part the Mesopotamian plain. Pitman saw several at Feluja on May 2nd and obtained one, and on May 7th saw several more which departed in N. W. direction. On

May 21st Cheesman saw a party at Kizil-Robat and more at Kasr-i-Sherin just over the frontier, they were flying N. E. Cumming records it from Fao in the brown juvenile dress. At Urfa Weigold found it common in the vineyards in May. It is apparently a rare bird in S. Palestine and Egypt and its migrations must be largely east and west.

8. Golden Oriole. Oriolus oriolus.

Oriolus oriolus oriolus (L.) (Syst. Nat. Ed. X, p. 107, 1758—Sweden).

The Golden Oriole is a bird of passage in small numbers; arriving rather late in spring, its passage appears to cover the last week in April and the first part of May. Pitman saw it at Feluja on April 27th—29th and Cheesman found males in song at Khazimain on 29th; Buxton met with it at Amara on the 30th and again on May 7th. It was noted at Nasiriyah in May and Cheesman found it at Khanikin on the 21st. Logan Home records that he saw a female at Daur on June 2nd. We have no evidence of it breeding.

At Urfa it would seem to arrive earlier, as often is the case with other migrants, and it is also commoner there; Weigold records that the males arrived on April 18th and the females on the 29th. Cumming recorded it as a passage migrant at Fao in May and June and again in September.

In autumn there are few records: Kut, August 9th; Amara, 2nd week in September (Buxton); Ramadi, September (Brooking); Basra, September 4th (L. Home); Fao, September 10th (Cumming); while there are skins in the B. M. from Mesopotamia on August 20th and September 1st.

♂, Two skins examined: Feluja, 27-4-17 (C. R. P.); ♀, Amara, 11-5-18 (P. A. B.).

9. Goldfinch. Carduelis carduelis.

(1) *Carduelis carduelis niedicki* (J. J. Ornith, 1907, p. 623—Eregli) (Taurus

(2) *Carduelis carduelis loudoni* (Morn. Monats., 1906—Lenkoran ?).

Goldfinches appear to be rather local and scarce in winter, possibly they are erratic visitants. Cheesman noted it at Qalet Saleh on November 25th, 1917, and on December 20th the same year Buxton found some flocks inhabiting gardens at Amara where they remained till the middle of February. Ross met with a large flock on thistles at Suleimania on December 19th, 1919, and Bailey at Shustar on February 2nd. Weigold obtained two birds at Urfa in April but apparently they were not breeding there; one he thinks is not distinguishable from the European bird and the other is paler and he places it as *niedicki*. Meinerzhagen records a flock at Baghdad on January 2nd.

(1) Nine skins: examined ♂, ? Shustar, 3-2-18 (F. M. B.); ♂, Qalet Saleh, 25-11-17, ♂, Amara, 12-2-18 (P. Z. C. and R. E. C.); ♂, Amara, 27-12-17, ♂?, 13-1-18, ♂ 13-1-18, ♂, 19-12-17 (P. A. B.); Suleimania, 19-12-19 (Ross).

(2) ♂, Amara, 23-11-17, (P. A. B.).

It is quite evident that two races are represented here and that none of the skins are referable to the typical race; the nine skins above are all too pale on the mantle for this latter race and the cheeks are sullied white; the colour of the mantle alone, a grey brown, separates them at a glance and they are rather smaller. They correspond well with *niedicki*, six topotypes of which I have examined from Eregli, in colouration and in size. The Eregli birds measure 75·5—82 in wing and the Mesopotamian ones 76-81·5 mm. Drs. Buxton and Hartert, who also looked at these birds considered them to be Zarudny's *harmsi* (a name he substituted for *minor* and *brevirostris* which were preoccupied) but neither they nor myself have seen topo-types of *harmsi* (Lac Krasnoye near Baku). However as these birds agree well with *niedicki* and this is the older name they must stand as this and probably it will be found that *harmsi* is a synonym. There is a specimen of this race *niedicki* (Woosnam coll.) in the B. M. from S. coast of the Caspian in March which Witherby (Ibis. 1910. p. 510) records as *minor*.

The single bird (Amara, 23-12-17) stands out from the rest at once and evidently belongs to a different race. It is browner, not so grey above, and more extensively and purer brown, not grey brown, on the flanks, and this colour reaches the undertail coverts. Dr. Buxton tells me it matches well a series of *loudoni* in the Tring Museum from Lenkoran ; these are more like the typical race, but have the crown crimson red, not so flaming vermillion and the spots on the side of the breast dull brown not red brown, and are of the same size—that is larger than *niedicki*.

Lastly there is a bird in the B. M. obtained by Woosman on the Diz R. on March 11th. Witherby (Ibis, 1907, p. 100) referring to this specimen thought it was perhaps nearest the typical race, or might be *volgensis* of Buturlin of which he had seen no specimens. I have examined this bird and could come to no decisive opinion about it ; it certainly is not either *niedicki* or *loudoni* and it is rather large and richly coloured for the typical race. It matches fairly well a bird from Samarkund which is *major*, except that the upper part of the rump is greyer, but I notice that the pureness of white rump in *major* varies somewhat, however it is darker on the mantle than most *major*, are ; in absence of any further similar specimens and of any topo-types of *volgensis* (Ibis, 1906, p. 424, Ssuram to the Urals) one cannot come to any determination, but I may remark that this bird seems to agree with Buturlin's description, and Zarudny records this race in winter from the Karun district.

The distribution of the various races of Goldfinches in this corner of Asia require much more study and further specimens are needed before we can come to any satisfactory conclusion about them. Zarudny says *loudoni* is the breeding bird of Shustar and Kasvin and Buxton found it common at Resht in winter and I have seen winter specimens from Shiraz. The breeding bird of the Persian plateau is apparently *harmsi*, which probably is the same as *niedicki*.

10. Siskin. Carduelis spinus.

Carduelis spinus (L) (Syst. Nat. Ed. X, p. 181, 1758—Sweden).

One obtained by Ross at Suleimania on January 7th, 1920, is the sole record.

11. Linnet. Acanthis cannabina.

Acanthis cannabina fringillirostris, Bp. and Schleg. (Mon. Lox. p. 45, 1850—Cashmere).

Evidently the Linnet is a scarce winter visitor ; Buxton met with a flock of twelve at Amara on February 11th and obtained specimens. Meinerzhagen recorded a flock of Linnets at Nineveh, and Ross got one at Suleimania from a large flock feeding on thistles and reeds on January 29th ; Bailey obtained two early in January at Shustar, where Woosnam had previously met with it (March 21st) ; Witherby thought Woosman's bird was rather dark for this race. Zarudny says that *fringillirostris* is a winter visitor and passage migrant and that the typical race is rare in the Karun district. I have seen none that could be ascribed to the typical race, all our skins are typical *fringillirostris*.

Four skins examined : Amara, 11-2-18 (P. A. B.) ; Shustar 1-2-18 (F. M. B.) Suleimania, 19-1-20 (Ross).

12. Red-fronted Serin. Serinus pusillus.

Serinus pusillus (Pall.) (Zoogr. Rosso-Asiat. ii, p. 28, 1811—Caucasus and Caspian).

Apparently a scarce, perhaps erratic winter visitor. Buxton met with a flock in a garden at Amara on February 7th, 1918, and obtained four specimens. It breeds in the Caucasus, North Persia, etc.

13. Trumpeter Bullfinch. Buchanetes githaginea.

Buchanetes githaginea crassirostris, Blyth. (J. A. S. B. XVI, p. 476, 1847—Afghanistan).

Tomlinson found this Bullfinch breeding at Ahwaz on a barren hillside on March 25th ; the nest sheltered by a projecting piece of rock contained 4 fresh eggs. Zarudny records it in winter and as nesting in the Karun District in small numbers. No specimens examined but I accept Zarudny's determination of the race. Jourdain informs me that these eggs resemble those of other races of this species and average $18{\cdot}7 \times 14{\cdot}2$ mm.

14. Rose Finch. Rhodospiza obsoleta.

Rhodospiza obsoleta (Licht.) (Eversm. Reise, Anhang., p.132, 1823 —Bokhara).

Buxton obtained one at Amara in a pomegranate bush on December 16th, 1917, it was extremely tame ; he found the remains of another on December 31st. Weigold met with it once at Urfa on April 18th. Tomlinson obtained a nest of 5 eggs on barren hills near Ahwaz on March 25th, 1913 ; 3 of these eggs are in Jourdain's collection and he tells me they exactly agree with eggs from Quetta. No birds were obtained and I consider the evidence inconclusive as certainly in Quetta this bird does *not* breed on barren hills, but in vines and rose bushes in gardens.

15. Chaffinch. Fringilla cælebs.

Fringilla cælebs cælebs, L. (Syst. Nat. Ed. X, p. 179, 1758—Sweden).

The Chaffinch is probably a weather migrant in winter to the Mesopotamian plains, and does not come till forced by the hardness of the weather elsewhere. Buxton first noticed it at Amara after a three days cold snap on December 15th and they remained fairly common till March 6th. Pitman records small flocks at Samarra in January and February. It is recorded from Baghdad, Suleimania, Tekrit, Sushtar, from November to January and at Hit on March 8th ; Buxton found it common at Khanikin on November 23rd. Sassi and Meinerzhagen record it at Mosul in January and Zarudny as winter visitor to the Karun district.

Fourteen skins examined : ♂, Amara, 7-3-18, ♀, 11-1-18 (P. A. B.); ♂ ♀, Sushtar—14-1-18 (F. M. B.) ; 6 ♀ ♀, Samarra, 29-1-18, ♀, Baghdad, 30-12-17 (C. R. P.) ; ♀ Amara, 2-1-18 (P.Z.C. and R. E. C.), 2 ♀, Suleimania 14-11-19. (Ross).

I cannot separate these from west European birds. Chaffinches vary much in colour of the breast, the tint in the males being very variable and that in the females probably becoming pinker with age, and this obtains in these Mesopotamian birds as well as in European ones. I can pass no opinion on Menzbier and Sushkin's *salonikoi* from Krim and W. Caucasus. (Orn. Monat., 1913, p. 192.)

16. Brambling. Fringilla montifringilla.

Fringilla montifringilla, L. (Syst. Nat. Ed. X, p. 179, 1758—Sweden

Recorded by Sassi from Mosul in November and February, and by Zarudny in winter in small numbers in the Karun district.

17. Rock Sparrow. Petronia petronia.

(1) *Petronia petronia exigua* (Hellm) (Orn. Jahrb., 1902, p. 128—Rostov on the Don).

(2) *Petronia petronia intermedia*, Hart. (Nov. Zool., 1901, p. 324—Gilgit.)

None of our observers met with this species for certain. Sassi records *exigua* from Mosul on January 24th.

Weigold saw some race at Biredjik where it breeds.

Zarudny and Harms say that *intermedia* is not rare at Salmi in the Karun district in winter ; it breeds in the oak wood district of Central Persia (Woosnam). Meinerzhagen records a Rock Sparrow from the hills near Mosul in January and Kingdon Ward says he saw a pair at Samarra.

18. Desert Rock Sparrow. Carpospiza brachydactyla.

Carpospiza brachydactyla (Bp.) (Consp. Av. i, p. 513, 1850—Konfuda in W. Arabia).

Cheesman found this peculiar sparrow migrating in flocks on April 18th at Fatah Gorge passing up the line of the Jebel Hamrin range going N. N. W.

He says the flight reminded him of that of a Hawfinch and the note is that of a Bunting ; a large migration was in progress that day, other species moving in the same direction were Spanish Sparrows, Ortolans and Wagtails.

The crops of specimens obtained contained seeds ; the organs were advanced. Later he found it breeding at a fair height on the Kermanshah road in Persian Luristan and the song is a long drawn out note like that of Buntings. The legs and feet in the male are horn colour, in the female pale flesh.

Zarudny records it as a winter visitor and passage migrant in the Karun area ; it must I think breed not far from Fao as there is in the British Museum one got by Cumming in 1893 in juvenile dress. This plumage resembles the summer adult (worn) dress but it is a trifle more sandy, and much more sandy than the winter plumage.

Three specimens examined : ♂♀, Fatah Gorge, 18-4-19 ; ♂, Tekrit, 19-4-19 (P. Z. C. and R. E. C.). These agree well with Arabian specimens.

19. Yellow-throated Sparrow. Gymnorhis flavicollis.

Gymnorhis flavicollis transfuga, Hart. (Vog. Pal. F.), p. 145—Bahu-Kelat, Baluchistan).

This is one of the Indian species which extends its range to Mesopotamia. It is a summer visitor to the date palm areas from Fao to Baghdad arriving in April, breeding in the latter part of May or even earlier and leaving again in August and September. Beyond Baghdad there are no records of it ; here Cheesman found several in song on April 27th and the organs of a male were well advanced, they were evidently breeding in the tall date palms. Tomlinson records that it breeds in holes of date palms at heights varying from 8 to 20 feet at Basra ; the nest is a typical sparrows, untidily built of dead grass and lined with feathers and contains not more than 4 eggs. Cumming however at Fao notes as many as five or six eggs in the clutch, and says the eggs are typical sparrows eggs but vary much in colour and notes three distinct types, one of which is erythristic—a pinkish white ground mottled with pale reddish brown spots. Jourdain informs me the eggs in his collection are at once recognizable from those of the House Sparrow by their smaller size, and the average size of ten eggs is 18·8 × 13·8 m.m.

Cheesman records that one shot had the gizzard full of beetles.

Five skins examined : ♂, Fao, 6-5-18 (Armstrong); Khazimain, 27-4-19 ; Basra 18-4-17 (P. Z. C. and R. E. C.) ; 2 Basra, 1918 (Hobkirk).

These correspond perfectly with topo-types from Baluchistan which are paler than the typical race from the Central Provinces of India.

20. House Sparrow. Passer domesticus. "Asfur."

Passer domesticus biblicus, Hart. (Vog. Pal. F., p. 149—Sueme, Palestine ?).

A very common resident throughout Mesopotamia wherever there are habitations, and even following the camps out into the desert. In places where food is abundant such as supply depots, mule lines, etc., it occurs in huge flocks. They breed early, as Cheesman noted them feeding young with caterpillars on April 19th, and nests may be found at the end of June ; so that as in other races this form has two or more broods. A variety of nesting sites are chosen ; Pitman found at Kut and Adhaim many nests in scrub jungle, some in quite small bushes, and Zarudny records finding 29 nests in one small bush in the Karun district : trees of course are utilized, especially poplar and palm buildings

Photo. Capt. W. Edgar Evans, 20th Oct., 1917.

A.—Creek at Makina, near Busra, Mesopotamia.
Habitat of *Halcyon smyrnensis*, Yellow-throated Sparrow, Indian Roller, &c.

Photo. Capt. W. Edgar Evans, Nov., 1918.

B.—From Table Mt. Jebel Hamrin, N.E. of Baghdad. Rock Nuthatch, &c., ground. Ravens, Griffon Vultures, See-see, *Ammomanes*, &c., seen on these hills.

and ruins of all sorts, holes in banks, and even the nest hole of *Ceryle rudis* was appropriated in one case reported by Evans, the deserted Kingfishers being found behind the Sparrows.

The question arises what race or races of House Sparrow inhabit our area. From S. W. Persia and the head of the Gulf *indicus* has been repeatedly stated to occur (Zarudny, Harms, Witherby, etc.). Now I have examined a very large series from the Mesopotamian plain,—from Basra in the south to the Adhaim in the north, and these match typical *biblicus* in every way and certainly are not *indicus*, as they are too large and have *grey*, not white cheeks. In S. W. Persia I have seen *biblicus* from Shustar, Dizful and even up to Kermanshah. The south coast of the Caspian is inhabited by sparrows which I cannot separate from the typical form. *Indicus*, which is a small bird (wing usually 76-78 mm. in males) and has white cheeks, I have not seen west of Gwader on the Mekran coast; at Bampur, Karman, Shiraz, Bushire (in winter), Afghanistan and probably Beluchistan there lives a white-cheeked sparrow which has always been called *indicus*, but for this it is much too big; it is *parkini* of Whistler, a bird of considerable range and whose type locality is Srinagar. Cashmere (*vide* Bull. B. O. C. cclii, p. 13, 1920). Weigold says that specimens from Urfa are not distinguishable from the typical form and Kolibay thinks the same. I have seen none from this district so cannot pass any opinion. Sassi records *indicus* from Mosul, probably an error.

23 skins examined: ♂, Kazimain, 9-2-19, 6-5-19; ♂, 7-4-19; Amara, 14-3-18 (two); ♂, Basra, 19-4-17; ♀, Shustar, 13-1-18; ♀, Sheik Saad, 25-11-16; ♀, Zoar, 4-2-19 (two) (P. Z. C. and R. E. C.); 2 ♂ ♀, Samarra, 6-3-18; ♂, Adhaim, 20-10-17 (two); ♂, 7-10-17; ♀, Bait-al-Khalifa, 21-12-17 (two) (C. R. P.); ♀, Shustar, 13-1-18; 3 ♀, Basra, 21-11-17; ♀, 17-3-18 (C. B. T.). Wing ♂, 79—83·5 mm., bill from base 14. ♀ 77·5-82mm.

21. Scrub Sparrow. Passer moabiticus.

Passer moabiticus moabiticus, Trist. (P. Z. S. Lond, 1864, p. 169—Dead Sea).

This handsome little Sparrow is a local resident in suitable localities, wandering away from its breeding haunts further afield in winter. Buxton met with a small flock at Amara on December 9th in deep scrub of *Prosopis*, *Rubus*, *Tamarix*, Liquorice, etc., and he saw another flock in the same place mixed with *domesticus* on the 16th. Pitman found several large flocks 10 miles N. of Kut near the Tigris in scrub and *Sueda* bushes on March 3rd and met with them again in the same area in scrub round floods on April 7th and 10th. He noticed them searching the leaves of the *Sueda* bushes for insects. Cheesman met with it mixed with flocks of *hispaniolensis* near Amara on January 13th. He has already given an account (Bull. B.O.C. CCXLVI, p. 39) of the nesting of this bird which I reproduce:—

"On May 1st, 1919, this colony was nesting in thick scrub jungle near Baghdad. The jungle was several miles in extent on the banks of the Tigris. . . . The nests were always built in the stout stems of the Euphrates Poplar or trees of dwarf Tamarisk 5 feet to 8 feet from the ground. There were perhaps 100 nests scattered over 6 miles. Generally the nests were 200 yards apart. The main structure is of sticks and resembles a small Magpie's nest. The large size of the stick selected is remarkable when the smallness of the bird is considered. The eggs are placed on a thick pad of down from rushes and thistles, a few fibres and small feathers. The roof is covered in, and the entrance is a small hole which winds down out of sight from the top in a spiral."

"One nest contained one half-fledged young and one egg, another 5 eggs, 2 fresh and 2 near hatching, another 6 eggs all fresh, another 3 eggs all fresh. One nest, an old one, was being renovated by a pair of birds. The

clutches are usually composed of a majority of dark eggs, with one or two totally different, being white with a few brown spots or blotches."

Zarudny, who first discovered this Sparrow in Mesopotamia, found it in great numbers in the lower reaches of the Karun between Ahwaz and Nasrie at the end of January and beginning of February in jungle of Tamarisk, *Lycium* and Poplar. Here he found old nests. He also met with it at Shellgati on the Gagar R. in thick fruit gardens and at Kulichan on March 24th found it breeding in Tamarisk. From specimens he obtained on this expedition he separated this Sparrow as *mesopotamicus*, being intermediate in colour between *moabiticus* from the Dead Sea and the very distinct Seistan form *yatii* and he says it is larger than *moabiticus*.

He gives the measurements of *mesopotamicus*—

♂, wing 62–66·3, tail 52·3,—56.5 m m.
♀ ,, 59·3–63·5 ,, 49·3—53·6 m m.

Of typical *moabiticus* he *only had two* specimens for comparison !

I have examined the following skins from Mesopotamia :—

♂, nr. Baghdad, 30-4-19, W. 64·5, T. 59·5, B. 10 (P. Z. C. and R. E.C.).
♂, Amara, 16-12-17, W. 66·5, T. 50·5, B. 10·5 (P.A.B.)
♂, Amara, 9-12-17, W. 63, T. 48·5, B. 9·75 (P. A. B.).
♀, Amara, 16-12-17, W. 62·5, T. 51, B. 10 (P. A. B.).
♀, nr. Baghdad, 30-4-19, W. 62·5, T. 49·5 B. 10 (P. Z. C. and R. E. C.

Of typical *moabiticus* from the Dead Sea I have examined 11 males and 9 females. These males measure W. 61—64·5 m.m., T. 47·5—62 m.m. and the females W. 59–62, T. 47·5–51. Between the Mesopotamian and Dead Sea birds I cannot see the slightest difference in colour and, as above, there is practically no difference in size. I can only regard *mesopotamicus*, Zar., as a synonym of *moabiticus*, Trist.

22. Spanish Sparrow. Passer hispaniolensis.

Passer hispaniolensis transcaspicus, Tschusi (Orn. Jahrb., 1903, p. 10,—Jelotan in Transcaspia).

A winter visitor in great numbers, widely but rather patchily distributed. There are no records of it before December 7th when Buxton noted that many arrived at Amara and spent the winter. They became commoner still in February and then gradually disappeared, the last being seen in the first week in April. He noted that they did not consort with House Sparrows and used to roost all the winter in dense Poplar scrub and *Lycium* bushes in the desert, even a couple of miles from the river. Pitman found it common in the Kut area in February and says it may have been there earlier, and he noted it wherever suitable scrub existed between Kut and Baghdad ; he met with it again at Feluja on April 17th during the spring migration of Wagtails, etc., while Cheesman saw large and frequent flocks on April 18th at Fatah Gorge passing up the line of the Jebel Hamrin together with Wagtails, Ortolans and *Carpospiza* in a very large migration rush. Cumming noted it at Fao with House Sparrows during the winter and early spring.

Zarudny in 1911 includes it in his Karun list as common in winter and *nesting in small numbers*. Writing in 1913 on the Sparrows of Persia (J. F. O., 1913) he says it is common at Wais, Mohommera and Karun River, also at Ahwaz and Shustar, from January to March and adds *there is no evidence of its breeding* ! He further remarks that birds corresponding to *palestinæ*, Tschusi, are to be found in Persia, Transcaspia, Bokhara and Turkestan. I do not know this latter race but some *transcaspicus* are quite difficult enough to tell from typical *hispaniolensis* including some Palestine and Mesopotamian specimens and single birds might equally well be of the latter form ; on the whole however I refer them to *transcaspicus*.

25 specimens examined : ♂, Shustar, 13-1-18, 18-1-18 (F. M. B.); 3 ♂, Amara, 29-1-18 ; ♀, Zoar, 4-2-18 ; Fatah, 18-4-19 (P. Z. C. and R. E. C.).

♂ ♀, Feluja, 17-4-17; ♀, Kut, 19-2-17, 3 ♂, 19-2-17 (C. R. P.); 6 ♂, Amara, 27-1-18, ♂, 21-1-18, 11-3-18, 25-1-18, 13-3-18, 28-2-18, 30-3-18 (P.A.B.).

Wing of ♂, 77-84 mm. The young birds of the year have broader edges to the upper parts and are very pale and these and fresh moulted birds are the most easily distinguishable, worn birds are most difficult to separate. The males of the year have on the whole the shorter wing.

23. Tree Sparrow. Passer montanus.

Magrath is quite certain that he saw Tree Sparrows amongst flocks of Spanish Sparrows at Felahiyeh on February 10th, 1917. There are no other records for Mesopotamia, but as it is not an unlikely bird to occur (it occurs in many parts of N. Persia) in winter and Magrath knows the species well I include it.

24. Corn Bunting. Emberiza calandra.

Emberiza calandra calandra, L. (Syst. Nat. Ed. X, p. 176—Sweden).

The Corn Bunting is more or less resident in the Mesopotamian plain, apparently such migrations as it performs being only local and so in some places, such as Kut, it appears in the winter months only. It is widely distributed in winter, frequenting scrub, arable land and corn fields. To places where it is a winter visitor it leaves by about mid April and so a certain amount of migration may be noticed in districts where it is in winter not common, from the end of March onwards.

The only breeding record comes from Shaura about 40 miles south of Mosul where Aldworth obtained a nest of six eggs and the parent bird on March 24th.

It probably breeds elsewhere, as at Amara, where Buxton obtained a male with advanced organs on April 7th. Cheesman noted a pair in song and the male displaying at Sheik Saad as early as December 20th.

Weigold says this species was not common in the Urfa district and became rarer eastwards ; he records it from Serudj on the Euphrates. Zarudny records it as wintering in the Karun district, where Woosnam also found it at Shush and Shuster in March.

Nine skins examined : ♀, Shustar, 3-2-18 (two) (F. M. B.); ♀, Kut, 12-2-17 ; ♂, Feluja, 30-3-17; (C. R. P.); ♀, Sheik Saad, 24-3-17 ; 20-12-16 (P. Z. C. and R. E. C.); ♂, Zorr, 18-3-18; ♂, Amara, 7-4-18; o ? 11-2-18. (P.A.B.).

I cannot separate these birds from the typical race either by size or colour ; at least two Eastern races have been described, *minor* of Radde from Tiflis, *buturlini* of Johansen from Kastek in W. Siberia (*crede*, Hartert) and another *buturlini* of Zarudny from Turkestan ! I have examined a good many Turkestan birds and cannot separate winter or March birds thence from European ones. Eastern birds generally wear quicker than western ones and so birds, like Corn Buntings, appear greyer above and whiter below earlier in the year than do western examples ; but these latter in a few weeks will also become as grey and white as the eastern ones. Also the amount of brownness or greyness above and the yellowness or whiteness below varies a good deal individually.

25. Yellow Bunting. Emberiza citrinella.

This Bunting is apparently quite a straggler to Mesopotamia. Hobkirk is quite certain he saw one at Basra on April 10th and from his description it would seem that this was so. Sassi obtained two from Mosul on January 23rd and Weigold saw one near Urfa on April 8th ; both suppose that their birds belong to the eastern race *erythrogenys* which race Zarudny also gives as wintering in the Karun district. As I have seen no specimens from our area I leave out the trinomial name.

[Meinerzhagen states (Ibis, 1914, p. 390) that he saw *Emberiza leucocephala* near Baghdad ; as there are no other records of this bird I include the record in square brackets.]

26. Black-headed Bunting. Emberiza melanocephala.

Emberiza melanocephala, (Hist. pl. 42 1769,—Carniola). Scop. (Annus l. Nat.

To most of our district this species is, where it occurs at all, a passage migrant and all the records refer to the spring. Pitman says a few arrived at Feluja on April 17th and inhabited some locust-infested fields together with Ortolans and Wagtails until the 21st, when they disappeared. Cheesman noted odd ones at Fatah Gorge on April 18th and Tomlinson records a large flock at Shustar on the 19th. Cumming found it at Bushire on the 14th, while Cheesman reports it from Shush on May 1st. It would appear from the absence of other records that this species comes from the south-east and migrates along the line of the Jebel Hamrin.

In the Urfa district according to Weigold the males appeared on April 28th. It evidently breeds at Mosul, and perhaps elsewhere in northern Mesopotamia as Sassi says he received 11 eggs from there, but gives no further particulars.

Three skins examined : ♂ Feluja, 17, 21 and 22, iv, 17 (C. R. P.).

27. Red-headed Bunting. Emberiza icterica.

Emberiza icterica, (Add. ad. Pall. Zoogr. Russo. Asiat, ii, Eversm. p. 10, 1841—Caspian) (=*luteola auct*).

The only record of this species is that of a single young bird obtained at Fao by Cumming.

28. Grey-headed Bunting. Emberiza cinerea

Emberiza cinerea semenowi, Zar. (Orn. Jahrb. xv, 1904, p. 117—Arabistan).

This somewhat rare Bunting is recorded by Zarudny as a passage migrant in the Karun district. Cumming obtained it at Bushire on March 27th. As it nests in large numbers in Arabistan (Zarudny) and occurs in Syria it should be met with more commonly in Mesopotamia. Possibly it has been overlooked. The grey head and rump, and yellow throat should suffice to distinguish from other species.

29. Ortolan Bunting. Emberiza hortulana.

Emberiza hortulana, L. (Syst. Nat. Ed. X, p. 177, 1758—Sweden).

This also is a passage migrant within our area and most records refer to the spring. Cheesman noted large and frequent flocks passing up the line of the Jebel Hamrin at Fatah Gorge on April 18th, halting for a few moments on a bush by a pool to drink before dashing off N.N. W. again. Pitman records it in great numbers from April 15th to 20th feeding on young locusts and roosting in tall poplars. After the latter date only a few were seen and the last on May 8th. He also met with it in the Kut area from April 7th to 10th. Magrath saw a passing flock at Basra on April 22nd, and Cheesman came across small parties on the Baghdad-Tekrit railway feeding on the desert where it had been burnt by grass fires. Zatrudny records it as a passage migrant in his area also, and Weigold says they first arrived at Urfa on April 10th and continued passing to the end of the month. The only autumn record relates to the oasis of Shaiba where Cheesman found a pair at a well on September 27th.

Five skins examined : ♂, Basra, 18-4-17 ; ♂, Tekrit,17-4-19 ; Shaiba, 27-9-16 (P.Z. C. and R. E. C.); ♂ ♀, Faluja 17-4-17 (C. R. P.) ; ♂ ♀, wing, 89-93 mm.

These Mesopotamian birds differ in no way from European ones, nor do those I have seen from Persia, whence the so-called *shah* was described : *a few* Eastern birds are a millimeter or so longer than European ones, sex for sex, but the difference is not sufficiently marked to warrant separation.

30. Grey-necked Bunting. Emberiza buchanani.

Emberiza buchanani, Blyth (J. A. S. B, xiii, p. 957—Indian Peninsula).

Recorded only by Zarudny who says it is a passage migrant in the Karun district. It nests in small numbers in the Zagros Mountains.

31. Rustic Bunting. Emberiza rustica.

Emberiza rustica, Pall. (Reise, Reichs. iii, p. 698, 1776—Daruria).

Recorded by Zarudny as a winter visitor to his district.

32. House Bunting. Emberiza striolata.

Emberiza striolata striolata (Licht.) (Verz. Doubl. Zool. Mus., Berlin, p. 24, 1823—Ambukol in Nubia).

Zarudny records this Bunting also in winter in the Karun District and thinks it may nest there—presumably in the low hills.

33. Reed Bunting. Emberiza schœniclus.

Emberiza schœniclus pallidior, Hart. (Vog. Pal. F., p. 197—Aiderli in Turkestan).

The Reed Bunting appears to be uncommon, or very local as a winter visitor. Pitman states that he found a large flock near Kut frequenting some scrub of *Sueda* bushes by the Tigris in January, they were very noisy and shy ; otherwise he only met with a single bird at Samarra on December 18th. Cheesman got a specimen at Sheik Saad on December 6th, the bird's head was so covered with ticks that it could hardly fly ; Magrath records it at Basra where I saw a singe bird in reed beds on November 20th. Zarudny records this race as a winter visitor to the Karun, as also the typical form.

Four specimens examined : Sheik Saad, 6-12-16 ; Amara, 2-2-18 (P. Z. C. and R. E. C.) ; Samarra, 13-12-17 ; Kut, 13-1-17 (C. R. P.)

These all belong to the pale eastern race.

34. Black-crowned Finch Lark. Pyrrhulauda frontalis.

This Finch Lark was met with near the oasis of Shaiba on August 12th by Buxton and Cheesman. Logan Hume informs me he saw it in the same district (Rumailah) in June in pairs. It is evidently resident on this edge of the Syrio-Arabian desert and is not recorded from anywhere else in Mesopotamia.

Two skins were obtained, both males, wings 85 and 86·5 mm. and not quite fully grown. These two birds do not match any race of *frontalis* which I have seen, and although I think that the birds, inhabiting Shaiba will prove to be a new race yet I at present hesitate to separate them on only two specimens, as there is in all races a certain amount of individual variation.

This Finch Lark has a very wide distribution, various races ranging from N. E. Africa through Arabia to Baluchistan east to Sind and Punjab.

The following races have been recognized :—

(1) *P. f. frontalis*, Bp. (Consp. Avium, 1850, p. 512—Nubia), Our birds differ considerably from this in having a more finch like, stumpier, higher bill ; a black nuchal spot ; greyer rump and upper tail coverts and longer wing.

(2) *P. f. melanauchen* Cab. (Mus. Hein. i, 1851, p. 124—Abyssinan coast, Somaliland, etc.).

(3) *P. f. syncipitalis*, Blyth (Ibis, 1867, p. 185—S. Arabia). Rather near this race but Arabian examples I have seen measure in wing 79-82 mm.

(4) *P. f. affinis*, Blyth (Ibis, 1867, p. 185. Type Madras (in error!) I designate Karachi in Sind) Differs from Sind birds in the upper parts being more isabelline washed with grey and with no obsolete dark centres, while the black of the crown and under parts is more intense ; the wing is as long or longer. I have however been unable to see any Indian specimens in exactly the same plumage as these Shaiba birds.

The exact determination of this race is of considerable interest and further specimens are greatly desired. Between Shaiba and Persian Beluchistan there are no records of any Finch Lark.

35. Calandra Lark. Melanocorypha calandra. "Usawah."

(1) *Melanocorypha calandra calandra* (L.) (Syst. Nat. Ed. xii, p. 288, 1766—Pyrenees).

(2) *Melanocorypha calandra psammochroa*, Hart. (Vog. Pal. F., p. 210—Dur-Badom, Persia).

This is evidently a local bird and much commoner above Baghdad on the uplands than below on the plains. Logan Home says it arrived at Tekrit in December in large flocks and paired off at the end of February; he records that eggs were taken in this district—on March 29th a clutch of five, and another of four at the end of May; at the nest the birds were very tame; one was secured for identification. Cheesman found it plentiful on the hills and plateau at Kalat Sherghat early in December, and at Samarra Pitman saw large flocks and obtained several examples; here he found them in immense flocks from mid-November, when he arrived, till mid-March when he left, though a good many moved away during February. They were very noisy and frequented mule lined, camps, litter roads, etc., and proved excellent eating! In the Adhaim area from September to mid-November and at Feluja from March to April he however never met with it. At Urfa Weigold found this Lark quite common in large flocks on passage in mid-April, but he obtained no specimens. Sassi, who examined four skins from Mosul, considered them to belong to the typical race, not to the eastern.

From Baghdad southwards there are few records; Buxton met with a single bird at Kumait on February 28th and Cheesman found a few small parties at Twin Canals on December 1st. Entering the hill country again Witherby recorded it from Ahwaz on February 26th and Bailey obtained it at Shustar on February 1st. Zarudny lists it as a winter visitor (Karun District).

Eleven skins examined: ♂ ♀, Shustar, 1-2-18 (F. M. B.); 4 ♂, Samarra, 14-12-17; 2♀, 4-12-17, 31-12-17 (C. R. P.); ♂, Shergat, 12-188, ♀, Twin Canals, 1-12-16 (P. Z. C. and R. E. C.); one, Kumait, 28-2-18 (P. A. B.).

In determining these birds I have examined a very large series of Calandra Larks. Compared with European and with eastern skins (Persia, Turkestan, etc.), they correspond best with the latter (*psammochroa*), in being paler and yellower, especially on the rump and mantle, than the western race; one must be very careful in comparing these larks to compare birds in a similar state of wear; it is true that *psammochroa* is on the whole a *yellower* bird than *calandra* but as time goes on (April-May) it also gets very grey, rather a paler grey than the western birds. Some birds partly worn (about December) in both races are difficult to tell and odd ones of our Mesopotamian birds might equally belong to either race. From Pitman's observations it seems probable that some Calandra Larks are winter visitors and it is possible that these belong to the typical race which Sassi too recorded from Mosul.

Birds which I have examined from Palestine (Sharon, Meroni, Bashan and Ludd (10 skins) are quite different to the Mesopotamian birds in being much more rufous brown, and in fresh feathers are very red brown, with red brown flanks; these I take to be Meinerzhagen's *hebraica* (Bull. B. O. C. XLI, p. 21): one bird too from Cyprus and one from Syria match them exactly, other Cyprus birds being *calandra*; on the other hand *psammochroa* is evidently also found in Palestine whence I have seen two examples (Jaffa, March 3rd, and Judæa, February 1st). From Anatolia and Erzeroum I have seen the typical western form. Meinerzhagen (l. c.) seems to think that his *hebraica* has a shorter wing than *psammochroa*; he gives for males 127—131 mm. as against 130—135 mm. in *psammochroa*. With this I cannot agree as those which I have examined of

hebraica run up to 137 mm. Nor can I find any difference in wing measurements between *calandra* and *psammochroa*; in the two sexes the wings range from 118.—142 (22 from Europe) and 120—138 mm. (Persia, Turkestan, etc.). Bills are very variable apart from sex in all these races, some are large, some small; some high and stout; some long and thinner, and I can state with some confidence there is no difference in wing length in the three races.

36. Bimaculated Lark. Melanocorypha bimaculata.

Melanocorypha bimaculata bimaculata (Menetr.) (Cat. Rais., p. 37, 1837—Talysh).

The only record of this species is from Cheesman who on April 19th found several pairs evidently breeding in well clothed desert country along the Samarra-Tekrit railway, and obtained a specimen which belongs to the typical form. It has been recorded from Shustar on March 21st and is entered as a winter visitor by Zarudny to the Karun area. As both species of this large Lark breed in Mesopotamia, I must warn oologists, though it should not be necessary, to obtain the bird with any eggs they take.

37. Short-toed Lark. Calandrella brachydactyla.

(1) *Calandrella brachydactyla brachydactyla* (Leisler). (Ann. d. Wetter. Ges. iii, p. 357, 1814—Montpellier, S. France).

(2) *Calandrella brachydactyla longipennis* (Eversm). (Bull. Soc. Imp. d. Nat. Moskow, xxi, p. 219, 1848—Dzungharia, E. Turkestan).

(1) No observers distinguished between this species and the Lesser Short-toed Lark in the field and so it is impossible to do more than state that Pitman met with a few, which had just arrived, on October 16th and 17th at Samarra and obtained two specimens belonging to this race. Weigold got several specimens in the Urfa district where he says it was very common between April 18th and May 2nd.

The status requires further investigation.

(2) Cumming obtained a typical specimen of this race at Fao on September 25th, 1886. It is in the British Museum where I have examined it.

38. Lesser Short-toed Lark. Calandrella minor.

(1) *Calandrella minor heinei.* (Hom.) (J. F. O., 1873, p. 197—Volga).

(2) *Calandrella minor minor* (Cab.) (Mus. Hein. I, p. 123, 1851—N. E. Africa).

(1) Pitman's notes apparently mostly refer to this race of which he obtained a large series. He says they arrived in large flocks about the middle of October and from the 26th onwards thousands were passing to the south in the Samarra district. They were exceedingly plentiful in this district from mid-November till the middle of February when they began to disappear and by the end of the month most had gone. A few were noted on March 15th—19th in the Baghdad area and the last recorded was on the 23rd at Feluja. During the winter at Samarra they frequented a bare plain where there had been grass, etc., in flocks of thousands and were distinguished by their noisy chirping and dipping flight.

Buxton says this race was not common round Amara itself but he found it common in small flocks out in the desert among *Suæda* bushes in winter. It is probably common in suitable places throughout the country. I obtained one from a large flock of mostly *minor minor* at Basra on November in a short grass field and Cheesman obtained several specimens on the Tigris in the Shiek Saad—Azizieh district.

19 specimens examined: Samarra district, 26-10 to 21-12-17 (11 skins) Feluja, 23-3-17 (2 skins) (C. B. P.); Amara, 16-12-17 (P. A. B.); ♂ Azizieh, 3-1-19 (2 skins); Sheik Saad, 1-11-16; Twin Canals, 1-12-16 (P. Z. C. and

R. E. C.); ♂ Basra, 21-11-17. (C. B. T.) Wings measure, ♂♀ 90-103. This race is greyer and less red-brown than *m. minor*.

(2) The status of this race is obscure. Cheesman obtained one from a flock at Kasimain in the desert on March 5th and one of Pitman's Samarra birds on November 4th on which day he got also *heinei*, I refer to this race; probably they flock together in winter as I obtained twelve specimens out of a huge flock at Basra on November 21st and from the same flock one typical *heinei*. Cumming obtained two at Fao on August 26th and September 25th, 1886.

Zarudny records *minor* and *persica* from the Karun district in winter and on passage; no specimens of ours are referable to *persica*. ♂ 92—95·5; ♀ 87·5—91 mm.

Some sort of Short-toed Lark, whether of the *minor* or *brachydactyla* group is not known, breeds, according to Cheesman, on the undulating uplands above Tekrit.

39. Desert Lark. Ammomanes deserti.

Ammomanes deserti fraterculus, Trist. (P. Z. S. Lond., 1864, p. 434—Palestine). (I restrict this to "Wilderness of Judæa".)

The Desert Lark occurs in at least four areas in Mesopotamia but whether all belong to the same species or race is not known. It is fairly common in the Tekrit-Adhaim area frequenting bare plain or rocky ground and is evidently resident and breeds there, as L. Home found them in pairs on the Tekrit uplands in May and found several nests, and Pitman and Cheesman met with it in this district in winter in pairs or small parties. It probably occurs in the foot hills up to the Kurdistan boundary. Pitman notes that it can always be distinguished in the field by its querulous piping note.

A Desert Lark occurs on the western side of the Euphrates in the Museyib district north of the Kerbela canal, where Pitman saw a few in June. Logan Home records it from the desert west of the Euphrates at Rumailah on June 5th, where it was evidently breeding. Zarudny says *fraterculus* is resident in the Karun foot hills. All our specimens come from the Tekrit-Adhaim area and all belong to the Palestine form *fraterculus*, but it does not at all follow that the birds from the Syrio-Arabian desert (west of the Euphrates) also belong to this form; they may even belong to a race of the other species *phœnicura*, and therefore specimens from this desert are highly desirable.

Buxton too informs me that one he obtained at Kasr-i-Sherin just over the Persian frontier on the Kermanshah road does not belong to the form *fraterculus* nor to any race of which there are specimens in British or Tring Museum. Further specimens from this neighbourhood also are *desiderata*. The Desert Larks are peculiarly local birds in their racial forms and though one may have one race of wide distribution, abutting on its area may be another race whose distribution is very local, and therefore the determination of this Lark in Mesopotamia cannot be fully made out until specimens are forthcoming from every district in which it occurs.

Nine specimens examined: Bait-al-Khalifa, 19-12-17 (two); Shat-al-Adhaim, 2-10-17 (two); (C. R. P). ♂♀, Samarra, 30-11-18; ♂, Tekrit, 17-4-19. (P. Z. C. and R. E. C.).

These are in no way distinguishable from specimens from the Dead Sea and Wilderness of Judæa.

40. Crested Lark. Galerida cristata.

Galerida cristata magna, Hume (Ibis, 1871, p. 407—Yarkand).

This may be said to be the commonest and most generally distributed bird in Mesopotamia, frequenting almost every kind of ground, though naturally scarcer in quite bare desert and thick scrub; even the oases have their pair of Crested Larks, about the only resident birds they can boast. It is resident throughout the whole district, but its numbers are augmented in winter by immigrants from

elsewhere (as noted by Buxton and Pitman), flocks being seen in February when most of the resident birds have paired off ; Cumming, who noted the same thing at Fao, states that these winter visitors come in August and leave in April.

The breeding season commences at the end of March ; the earliest nest contained three eggs on the 30th. Pitman, who found 39 nests, says many have nests and some are sitting by the middle of April and he notes young hatched on May 29th ; so that it seems certain that at least two broods are hatched out. The usual clutch is four or five and Logan Home several times found six in a nest. The nest, rather untidy and scanty, consists of dry bents, dirty straw, etc., and is placed in any convenient hollow such as a hoof mark, under a tuft of grass, or on bare ground concealed by grass, clods of earth, or bushes.

As in other races, this bird is a mimic of other birds. Pitman noted that it often perches on walls, low bushes, telegraph wires, etc., and does good by feeding on the maggots of flies. Many of them are subject to attacks by ticks and are much affected by heat, and then they seek the shade of tents and water courses in lieu of trees.

Thirty-five skins examined : From every month except May, June and September and from throughout our area from Samarra in the north to Basra and Shustar in the south ; 20 males, 8 females, 7 unsexed.

Wings of males 107—113 mm., of females 98·5—104 mm. Bills (exposed) both sexes 17—18·5 mm., 19—22·5 mm. from base.

These Crested Larks are so near *magna* that I hesitate to separate them and with this Dr. Hartert agrees. If anything they run rather smaller than the majority of *magna* but there is a big overlap. Wings of *magna* (Afghanistan, Beluchistan, etc.) which I have measured run 105—117 (once 120 mm.) and it will be seen that some of our Mesopotamian birds are smaller than this and none reach the extremely large measurements some *magna* shew. In coloration fresh moulted birds are quite like fresh moulted *magna*, but when a little worn most of our birds seem a trifle browner, less *sandy* yellow on the upperparts and the larger markings of these parts make them appear somewhat darker. One must allow for a certain amount of individual variation and certainly a good many of our birds could not be picked out from a series of *magna*. I have compared our series with the topo-types of *brachyura*, *iwanowi* and *subtaurica* and they certainly do not belong to any of these races. In *Orn. Monats*, 29, Kolibay separated as *weigoldi* the Crested Lark from Urfa (on one pair and two of doubtful sex). I have seen no specimens from this place but from the description they appear to be the same birds as ours. If any one considers the above characters as sufficiently distinctive then our Crested Lark must stand as *weigoldi*, but I am inclined to treat this name as a synonymn of *magna*.

41. Sky Lark. Alauda arvensis.

(1) *Alauda arvensis dulcivox*, Brooks (Stray Feathers, i, p. 484, 1873—Alpine region of N. India).

(2) *Alauda arvensis cantarella*, Bp. (Icon. F. Ital. Uccelli, Introd. p. 5 1832—41 Italy).

The Sky Lark is a common winter visitor to the Mesopotamian plains frequenting desert, plough and green crops, preferring open country to gardens. It arrives at the end of October and Pitman on the Adhaim river noted flocks flying south till November 7th. It is recorded from most suitable localities as far south as Amara and it is probably pure chance that there are no records from Basra district, as it occurs at Ahwaz and Bushire. Cheesman says that the Sky Lark is a serious pest in some districts, as at Sheik Saad, where large flocks cleared off acres of beet root and cabbage seedlings ; no method of prevention was found to be efficacious, both guns and two men per acre to scare the birds off proving useless ; he noted however that seedlings with more than four leaves are practically immune. The only plan which seems to offer

any solution would be to sow the seeds a little earlier so that all the plants have more than four leaves before the Sky Larks arrive, though whether this is possible or not I leave to the agriculturists. Logan Home noted that in the Tekrit area they often associated with Calandra Larks.

The Sky Larks leaves again in March, many have gone by mid. March and all have departed by the end of the third week.

Thirty skins examined November to March, but many of them were in poor condition and the determination of the races in some has been very difficult or impossible. There is no doubt however that the majority belong to the grey eastern form *dulcivox*, and that this is the commonest of the two races. Eight birds I refer to the South-East European race *cantarella* which is rather darker. Zarudny records both races for the Karun district in winter and Neumann records *A. arborea cinerea* (a mis-print for *A. arvensis cinerea* from Ras-el-Ain. 15 specimens of *dulcivox* measure :—Wing 105—120 mm.

Of recent years the name *cinerea* (or *cinerascens*) of Ehmcke has been used for this grey Eastern Sky Lark which is the breeding bird of West Siberia, Turkestan. etc., and quite incorrectly as I believe. Brooks (S. F. i, p. 484) described a Sky Lark, clearly of the *arvensis* group, from the Alpine region of North India as *dulcivox*. His description agrees well with the Siberian bird and he did not say nor is there any proof that his *dulcivox* was breeding in the Himalayas*. Most of the older records of Sky Larks breeding in this region were muddled up with *gulgula* and so far as I have been able to ascertain no *arvensis* breeds in the alpine regions of North India except perhaps locally in Cashmere, and these seem to me to be in no way different from the Siberian breeding birds, hence *cinerascens* must give place to the much older name of *dulcivox* for this race.

42. Wood-Lark. Lullula arborea.

? *Lullula arborea pallida*, Zar. (Orn. Monat., 1902, p. 54—(Mountains of Transcaspia.)

This species was perhaps overlooked by most observers as there are only records from Amara, where Cheesman and Buxton found it plentiful in small parties on the river banks from November to February 10th, 1918. I have no other records from Mesopotamia. Zarudny includes it as a breeding species in the Zagros and Khorasan districts.

Four specimens examined ; these are paler above, especially on the rump than the typical race from western Europe and the underparts not so yellow below, in fact barely tinged with yellow. Similarly pale winter birds are to be found in Palestine, the Taurus and Syria. Woodlarks are exceedingly difficult birds to determine races of as each month's wear makes such a great difference in the plumage, but these four skins are distinctly paler than West European ones at the same time of the year and it is probable that an Eastern race should be recognized and so I place them under Zarudny's name *pallida* tentatively, as I have not seen any birds from Transcaspia.

43. Bifasciated Lark. Alæmon alaudipes.

Alæmon alaudipes pallida, Blyth (J. A. S. B. xvi, p. 130, 1847—Ullah Bund in Sind.

So far as records go this lark is only found on the desert on the west side of the Euphrates and Shat-al-Arab ; Cheesman, who travelled extensively throughout the country, failed to meet with it elsewhere. Cheesman and Buxton met with it fairly commonly at Shaiba in June (breeding) and in August ; Logan Home at Rumailah on June 5th saw half grown young : Cheesman saw it near Nasariyeh, and Harrison at Ramadi in October. Pitman came across it twice, west

* He clearly considered (Ibis, 1892, p. 61) that the Punjab *arvensis*, the "big grey Skylark" which comes to the plains in winter, was *dulcivox*.

of Museyib, June 12th and a few miles west of Baghdad on May 28th, the only trans-Euphrates record. Cumming got it at Fao and Woosnam records it from the coastal plain of N. W. Bushire. It is probably resident where it occurs, and a true denizen of bare desert. Buxton notes that at Shaiba the desert is very slightly covered with pebbles, otherwise it resembles the desert in other parts of the plain. It is rather remarkable that its range should be so restricted, but in Sind I have found it a very local bird, so possibly it may yet be proved to inhabit other parts of the plain, indeed Zarudny records it from his "Mesopotamian region" which in this paper I have referred to as Karun district. Cheesman says he was often deceived by the note of this bird which is like the whistle of a school-boy.

Eight specimens examined: ♂ Shaiba, 1-6-18, ♀, 5-9-16, ♂, 11-9-16 (P. Z. C. and R. E. C.); ♂ Shaiba, 12-8-18, 22-8-18, ♀, 12-8-18 (P. A. B.); 2 Fao in B. M.

The worn breeding birds are very grey above; August birds in moult, with body feathers almost perfect, vary much in colour; a male, shot on the same day as a female in similar state of plumage, is much more washed with grey on the upperparts than the latter, in which sandy isabelline predominates; so that evidently one must be very guarded in depending on colouration in determining the races of these birds, and not only does individual variation have to be considered but the effect of wear, as in time the grey wash and the isabelline tone both get worn off leaving a pronounced grey colour. These birds match a series from Karachi very well. Wings ♂ 132-138, bill (exposed) ♂ 26-28, from base 32-33, ♀ 24-25, from base 30·5 mm. These are smaller measurements than Hartert gives (Vög. Pal. F., p. 251), but I find Karachi birds measure almost precisely the same.

44. Shore Lark. Eremophila alpestris.

Eremophila alpestris bilopha, Temm. (Pl. Col., 244, 1823—Akaba in Arabia)

Pitman was the only observer who came across the Shore Lark in Mesopotamia; he first noted a flock of six on December 12th, feeding on the parade ground at Samarra away from the Sky and Short-toed Larks. He saw others at the same place in January and also a flock of 20 or 30 out in the desert near the camp, while on February 9th, a large flock was met with at Daur.

Five specimens examined: ♂ ♂ ♀, Samarra, 30-12-17, ♂ ♀, 12-12-17 (C. R. P.). I cannot separate these from specimens from Algiers, Tunisia, Morocco and the Dead Sea. Wear often makes the upperparts a more orange-rust colour and less vinaceous pink.

45. Water Pipit. Anthus spinoletta.

(1) *Anthus spinoletta blakistoni*, Swinh. (P. Z. S., 1863 p. 90—R. Yangtze, China).

(2) *Anthus spinoletta coutellii*, Savig. (Desc. de Egypte, XXXIII, p. 360, 1828—Egypt).

There are remarkably few field notes about the Water Pipit, which is a fairly common winter visitor. A fair number winter in Mesopotamia but more are to be met with at the times of spring and autumn migrations, coming from and going to places further south. Buxton noted it as common in flooded places on the grass farm at Amara in November and December, and I found it common though exceedingly wild in similar situations at Basra in November. The spring passage appears to take place during the last week in March.

Sassi records *coutellii* from Mosul in January and Zarudny both races in the Karun district as winter visitors and passage migrants.

Thirteen specimens examined: *blakistoni*—♂, Amara, 7-11-17, 10-12-17, 26-2-18, ♀, 7-11-17; ♂ ♀, Baghdad, 22-3-18; ♂, Kurna, 17-3-18; Aligharbi,—3-3-18 (P. A. B.); ♂, Sheik Saad, 25-3-17 (P. Z. C. and R. E. C.) *coutellii*. Sheik Saad, 23-3-17, ♂ 22-3-17 (P. Z. C. and R. E. C.); intermediate ♂, Twin Canals, 2-12-16 (P. Z. C. and R. E. C.); Hawi Plain. 13-12-17 (C. R. R.).

The majority are *blakistoni*, so apparently this race is the commoner. I have examined a large series of both races from topo-type localities and it is by no means easy to separate out individual birds ; the most typical *coutellii* with the warmer brown upperparts, especially the rump, come from Egypt and Persia : probably the breeding area of this race is small compared with that of *blakistoni*, which has an enormous breeding range in Central Asia and is a very wide migrant. So that it is not to be wondered at that numerically *coutelli* gets swamped by its paler ally in its winter quarters. Of the thirteen specimens I regard nine as *blakistoni*, two as *coutellii* and two are somewhat intermediate between the two.

I find no difference in size in these two races ; a topo-type series of *blakistoni* measure 84-93 mm. (often 92-93), of *coutellii* 82-94 mm.

46. Meadow Pipit. Anthus pratensis.

Anthus pratensis, L. (Syst. Nat. Ed. X, p. 166, 1758—Sweden).

The various Pipits were so mixed up by so many observers that their status is a matter for further investigation. The Meadow Pipit would appear not to be very common, neither Buxton nor Cheesman met with it, nor did Cumming at Fao. Pitman obtained four skins at Samarra between December 14th and March 8th and I found it not uncommon in small flocks frequenting damp places in fields at Basra on November 20th and March 19th and obtained specimens on each day.

Zarudny records *A. pratensis enigmaticus* as a winter visitor and passage migrant in the Karun district. I do not know this bird, which Zarudny described from Tashkent in Turkestan ; the Mesopotamian birds agree well with European ones, and I suspect *enigmaticus* is really *cervinus*, which Zarudny omits from his Mesopotamian list.

47. Tree Pipit. Anthus trivialis.

Anthus trivialis trivialis, L. (Syst. Nat. Ed. X, p. 16, 1758—Sweden).

Cumming records this Pipit at Fao on spring and probably autumn passage. Pitman found it fairly common at Nahr Umar on March 26th, 1917, and obtained specimens there and at Feluja on March 29th the next year ; Cheesman obtained one at Basra on April 18th, Buxton records it from Amara on September 28th. Zarudny records it as a passage migrant in the Karun district and Weigold notes it on passage on April 10th as not rare in the oasis and gardens at Urfa, where there were still some on April 27th ; they were in flocks and the sexual organs were not developed. It breeds on the south coast of the Black Sea (Woosnam).

48. Red-throated Pipit. Anthus cervinus.

Anthus cervinus, Pall. (Zoog. Rosso-Asiat. i., p. 311, 1827—Siberia).

One obtained by Cheesman at Sheik Saad on April 3rd and two shot by Pitman at Feluja on April 16th, where he found it plentiful from 14th—17th., are our only records. Tomlinson records that he obtained one at Shustar on April 19th, and one at Basra on November 21st.

49. Tawny Pipit. Anthus campestris.

Anthus campestris campestris, L. (Syst. Nat. Ed. X, p. 166, 1758—Sweden).

The Tawny Pipit is a common winter visitor to the plains. Unlike most of the other Pipits it affects dry places and is to be met with in scrub, and desert where a little scrub is to be found ; it is found singly or at the most in pairs. It occurs from Fao and Shustar in the south northwards everywhere in suitable localities and Weigold records it from Urfa. The dates of arrival were not noted but there are specimens obtained as late as April 5th and Weigold met with it as late as the 23rd. According to Woosnam it probably breeds at Lake Van in Armenia.

Six specimens examined: ♀, Amara, 16-1-18; ♂, Legait, 2-3-18 (P. Z. C. and R. E. C.); ♀, Feluja, 29-3-18; Nahr Umar, 5-4-18 (C. R. P.); ♂, Amara, 23-12-17—16-12-17 (P. A. B.).

All belong to the typical race.

50. Richard's Pipit. Anthus richardi.

Anthus richardi richardi, Vieill. (Nouv. Dict. d'Hist. Nat. XXVI, p. 491, 1818—France).

Recorded by Zarudny as a winter visitor to the Karun district.

51. Plain Pipit. Anthus sordidus.

Anthus sordidus decaptus, Meinerz. (Bull. B.O.C. CCLIII, p. 23, 1920—Rud-i-Taman, E. Persia).

Apparently a winter visitor in quite small numbers, as there is only one specimen—obtained by Buxton at Amara on February 11th; he met with three or four in a ploughed field and remarks he had not seen it before. No one else records it but some may have mistaken it for the Tawny Pipit to which it bears some resemblance in general appearance and habits. Zarudny records it from the Karun district in winter.

Hartert (Vög. Pal. F., p. 269) separated the Palestine race of this Pipit as *A. leucophrys captus*. It is now generally recognized that it must stand as a race of the N. E. African bird, *A. sordidus*. Hartert gave the distribution of *captus* as Palestine, Persia, Afghanistan, Beluchistan and Sind. Meinerzhagen who recently got a good series of these birds in Palestine has pointed out however that the Palestine birds are smaller than those from further east and gives the wing measurement of the Palestine birds as 90-95mm. and in the eastern race, which he calls *decaptus*, the wing measures 95-106 mm. Buxton's bird, a female, has a wing of 97 and so clearly belongs to the eastern form.

52. Grey Wagtail. Motacilla cinerea (=boarula auct.).

Motacilla cinerea cinerea, Tunst. (Ornit. Britain, p. 2, 1771—Gt. Britain).

A winter visitor in small numbers, the first arriving at the end of August, and it is widely distributed in suitable places throughout our area. Most depart by the end of March and the latest date is April 11th; before they leave they assume full breeding dress. Weigold got three skins at Urfa in April and records that they are intermediate between *cinerea* and *melanope* and possibly an intermediate form occurs on the boundary between these two races, as the tails of his specimens, somewhat abraided, are shorter (93-95 mm.) than in any *cinerea*. He does not know if the Grey Wagtail breeds at Urfa.

Five skins examined: ♂ Kurna, 20-3-18, T. 100 (P. A. B.); ♂, Sheik Saad, 22-3-17, ♂ T. 98, 2-4-17, T. 98·5; ♂ Shaiba, 13-9-16, T. 100 (P. Z. C. and R. E. C.); Samarra, 13-12-17, T. 97 (C. R. P.).

None of these differ in any way from and all have as long tails as British ones.

53. Black-headed Wagtail. Motacilla feldegg (melanocephala auct). "Zit-ziata."

Motacilla feldegg feldegg, Michah. (Isis, 1830, p. 812—S. Dalmatia).

This Wagtail is an exceedingly abundant passage migrant throughout the country; the earliest date is March 13th and fair numbers may be seen throughout the rest of the month. Cheesman saw flocks of Wagtails, many being of this species going north at Sheik Saad in the third week of March, the males preceding the females. Huge flocks pass through in April but most have gone on by the third week. It probably breeds not far off as Pitman saw it at the Euphrates Barrage on July 8th, 1917, and many at Baghdad on the 18th.

Buxton also found a few in rice-fields by the Hawazich swamp on July 12th and one obtained was an adult male in very worn dress and just beginning to moult.

Magrath too found it on the Saweikieh marsh in short grass in mid-July while Logan Home records three or four seen and one shot (unfortunately the skin was lost) at Abu Aran, 40 miles from Busra, on June 26th. So it is quite within the bounds of possibility that it even breeds in the plains. Zarudny says it breeds in the Zagros and winters on the Karun; we have no winter records.

During their passage they affect any damp ground, particularly crops such as wheat, grass, rice, etc., and associate with other Wagtails. Curiously enough there are no specimens or records in autumn but the latter may be included under *flava*.

Nine specimens examined: ♂ ♀ Amara, 24-3-18; ♂ .Kurna, 17-3-18; ♂ .Hawizieh, 12-7-18 (P. A. B.); ♂ ,Sheik Saad, 27-3-17, 20-3-17, ♀ 25-3-17 (P. Z. C. and R. E. C.); ♂ Feluja, 21-3-27 (C. R. P.).

Wings 82-85. Tail 70-76 m.m.

The white chin and moustachal streak in *melanogriseus* are rather inconstant characters and some *feldegg* shew them; *melanogriseus* usually has a shorter wing and tail; thus within the range of both forms one may meet with single birds which are indeterminable and one or two of the above could not be picked out from a series of *melanogriseus*, possibly both races *do* occur, but a larger series are required to determine this.

I think it is perhaps better to treat the Black-headed Wagtails as a separate species and not as a race of the Blue-headed.

54. Blue-headed Wagtail. Motacilla flava.

(1) *Motacilla flava dombrowskii* (Tschusi) (Orn. Jahrb, xiv, 161, 1903—Roumania).

(2) *Motacilla flava thunbergi*, Billb. (Synop. Faun. Scand., 1, 2, Aves, 1828, p. 50—Lappland (*borealis auct*).

(3) *Motacilla flava campestris*, Pall. (Russ. Reichs, iii, p. 696, 1776—E. Russia).

(4) *Motacilla flava flava*, L. (Syst. Nat. Ed., x, p. 185, 1758—S. Sweden).

(5) *Motacilla flava leucocephala* ?, Przew. (Zap. Imp. Akad. Nauk. St. Petersb. ,Lv., p. 85, 1887—Dzungaria (Altai).

The records are not always separable into the different races unless born out by specimens. The commonest form would seem to be *dombrowskii* and all races are passage migrants.

(1) This race appears on passage about the same time as *feldegg* and mixes freely with it. Cheesman found it common at Sheik Saad in the last week of March and obtained specimens. Pitman got four at Feluja during a big rush of mixed Yellow Wagtails on April 15th to 18th. Yellow Wagtails of sorts were passing along the line of the Jebel Hamrin range at Fatah Gorge on April 18th. On the return passage Yellow Wagtails were noted in the first week of August and became commoner in the second and third weeks.

Many pass in September; Cheesman noted the gardens at Sheik Saad full of them on the 14th, and on 16th at Shaiba, flocks were travelling *north* low over the desert against the wind, these had probably made a turn in their migration to gain the river and avoid the desert.

Pitman saw flocks passing near Baghdad going S. E. on September 9th and again at Adhaim on 24th. Buxton noted many passing through Kut during the first week in September and many at Amara during the third week and up to October 3rd; after this there are odd records up to the 10th. Other forms are doubtless included in the above autumn notes.

About 15 skins of this race examined: ♂, Baghdad, 18-9-17, 19-9-17; ♂, Amara, 14-9-18, 9-9-18. (P. A. B.); ♂, Sheik Saad, 27-3-17; (two) 31-3-17, (two) (P. Z. C. and R. E. C.); ♂ ♀, Feluja, 17-4-17, ♂ 16-4-17, and several other females on same date as males.

The males in spring are very distinctive; the white chin is fairly constant, white moustache rather variable, supercilium broad and distinct (noticeable in the field), sometimes tinged with yellow; ear-coverts are very dark blackish-slate mixed with white. The females which I have presumed to be of the race have a clear supercilium white or buffish white; dark brown lores, ear-coverts and head. The adult male in autumn is not unlike the spring bird, but the head not so pure a dark grey, ear coverts dark brown mixed with a little white and the yellow breast has a gorget of dark spots, as in many other forms.

(2) Records of this race cannot be picked out. Probably it is fairly common at the same times of passage as the other Wagtails.

Buxton obtained two males at the Hamar Lake on May 18th from a party and Pitman got one at Feluja on April 14th, one obtained by Buxton at Baghdad on October 3rd I am inclined to think belongs to this race; it is a male with brown head and ear coverts, a white throat and hardly a trace of any supercilium.

(3) All that can be said of this race is that it is a fairly common passage migrant along with the other forms. Cheesman obtained one at Sheik Saad on March 27th when many Wagtails were on passage and two at Amara on April 19th and 20th where, with Buxton, he found them abundant in young wheat. Venning obtained one at Sheik Saad on April 11th. All these are adult males quite easily recognized of course by the large amount of yellow on the head. Two obtained by Buxton at Amara on September 9th I attribute to this race, the chin and supercilium are yellow and the head brown tinged with yellow.

(4) Apparently the typical form is rare; I can only attribute to this race one obtained by Cheesman at Sheik Saad on April 3rd, yet this is the only form of Blue-headed Wagtail mentioned by Zarudny!

(5) I only include this to draw attention again to this remarkable form (if a good race it be and not a partial albinism). Pitman says that at Feluja on April 16th among the thousands of Yellow Wagtails present he saw two birds which corresponded exactly to the description of this bird, that is, a Blue-headed Wagtail in which white, or nearly white, replaces the blue of the head and ear-coverts. Unfortunately he did not obtain it. This race is so rare that one cannot help being suspicious that it is only a partial albinism of a commoner race.

55. White Wagtail. Motacilla alba.

(1) *Motacilla alba alba*, L. (Syst. Nat. Ed., x., p. 185, 1758—Sweden).
(2) *Motacilla alba dukhunensis*, Sykes (P. Z. S., London, 1832, p. 91—Deccan of India).
(3) *Motacila alba persica*, Blanf. (E. Persia, ii, p. 232—Niriz, east of Shiraz).

White Wagtails are abundant winter visitors to the whole of our area. The first arrive in the first days of October but it is not until the latter half of the month that they become numerous, and then in suitable localities settle down singly or in quite small parties for the winter. Probably also it is a bird of passage as Pitman at Kut noted an increase early in March; by the end of this month they have become quite scarce again but a few may be found well on into April and according to Cumming at Fao occasionally early in May. This species was a constant attendant at the trenches, attracted by the hosts of flies and was but little perturbed by gun fire.

Races of course were not distinguished in the field but I think it can be safely said that the European race is the commonest; Witherby referred most S. W. Persian birds to *alba* as does Sassi 6 skins from Mosul.

Eleven skins examined:—*Alba*, ♂, Amara, 12-12-17; Baghdad, 6-10-17; ♀, Azizieh, 17-11-18 (P. A. B.); Shustar, 8-2-18; (F. M. B.) Sheik Saad, 26-3-17, ♀, 4-4-17, ♂, 10-2-17. (P. Z. C. and R. E. C.). *Dukhunensis*—Amara, 11-2-18; ♀, Baghdad 31-3-18, (P. A. B.) Sheikh Saad, 18-12-16 (P. Z. C.) and R. E. C.); Shustar n. d. (F. M. B.).

These specimens of *dukhunensis* have rather paler upperparts and *much* broader margins of white on the coverts and tertials than *alba* has. Other races were reported by various observers at different places, but in the absence of specimens I must omit *personata* altogether and the same remark applies to *lugubris*. which Meinerzhagen (Ibis, 1914, p.390) said he found to be common—a bird *most* unlikely to occur. However *persica* certainly occurs at Ahwaz; Woosnam got one there on February 27th and Zarudny records it as a winter visitor.

56. Large Rock Nuthatch. Sitta neumayer.

Sitta neumayer dresseri, Zar. and But. (Orn. Monats, 1906, p. 132—Mountains of S. W. Persia).

Buxton found Rock Nuthatches common in the gorge of the Diala river, where it cuts through the Jebel Hamrin, on November 22nd and Cheesman obtained this race at Kasir Sherin on May 22nd just over the Persian frontier in this district. Probably it occurs in suitable places all along the Jebel Hamrin as Baily obtained it at Shustar on February 7th. Cheesman found them in pairs on overhanging rocks near the rivers and says their call is like that of the English Nuthatch only louder.

Zarudny says it is resident in the Karun district, in the hilly parts only of course.

One skin examined: Shustar, 7-2-18 (F. M. B.). Wing 90, Bill from base 28·5mm.

57. Small Rock Nuthatch. Sitta rupicola.

Sitta rupicola tschitscherini, Zar. (Orn. Jahrb., 1904, p. 218—Ispahan).

This species, which in some parts at all events lives alongside the Large Nuthatch, is recorded by Zarudny as a resident in small numbers in the Karun district. We have no certain records of it. For a full account of Persian Rock Nuthatches, *see* Bull. B. O. C. ccli, pp. 135-9, where Buxton points out the very interesting fact that in N. W. Persia there are two kinds differing much in size but not in colour and in S. W. Persia these are replaced by two very pale subspecies also differing from each other in size but not in colour.

58. Great Tit. Parus major.

Parus major blanfordi, Prazak (Orn. Jahrb. v., p. 240, 1894—Teheran in Persia).

The Great Tit only occurs so far as we know at present in the Khusistan part which for zoological purposes I have included in Mesopotamia. Cheesman met with a family party at Shush in willow jungle by the Kerkha river where it evidently breeds. Woosnam also obtained it at Dizful and Shush in March. Zarudny gives it as a winter bird in this area.

Zarudny and Loudon (Orn. Monat., xiii, 1905, p. 108) separated the Great Tit of S. W. Persia (type locality Zagros Mts.) as *zagrossiensis* and gave a number of characters by which it differed from the typical race, *P. major*, of Sweden. I must here point out and protest against what is a not uncommon practice amongst some continental (and even some British) ornithologists and that is comparing some supposed new race, *not* with its nearest ally, but with something totally different. Now all Great Tits from the Persian plateau south to Khuzistan differ very markedly from Swedish birds and it is fairly obvious that, if birds from the Zagros are thought to be different to the former, it is with the Teheran *blanfordi* that they should be compared, and not with the Swedish birds.

Now I have compared 15 birds from Shush, Dizful, Shiraz, with a dozen or more from Teheran, Kasvin, Kermanshah, and I cannot see the slightest difference between the two series. The differences which Zarudny and Loudon give between *zagrossiensis* and *major*, when applied to the former and *blanfordi* I find either hold good in both or are inconstant in both. I consider that *zagrossiensis* is a pure synonym of *blanfordi*.

Great Tits from the South Caspian forest I consider to be inseparable from the typical form, an opinion I believe Buxton independently has come to.

59. Penduline Tit. Anthoscopus pendulinus.

Anthoscopus pendulinus persimilis, Hart. (Novit, Zool., xxv., p. 308, 1918—Eregli, Asia Minor).

The Penduline Tit appears to be a rare winter visitor to Mesopotamia. Buxton met with a family party in a *ziziphus* tree in a garden at Amara on October 25th and another party at Ali Gharbi on poplar scrub on November 17th. Venning obtained one at Busra on April 21st.

Three specimens examined. This Tit appears to take 15 months to become adult, that is to say, to became adult at the second autumn moult, unless it has a spring moult, of which I have seen no evidence in a good many examined. Two of the above specimens are in the first winter dress without the distinctive adult markings; the Basra bird is adult, but nearly all the feather on the head have slipped! so that the determination of the race is a difficult matter. They certainly do not belong to the typical race as they are too small and pale. They also are not *juvartensis*. They agree very well with Hartert's *persimilis*, specimens of which from Kaisarieh and Lake Urmia I have compared them with, in size of wing, paleness, and, as far as I could make out in the single adult, in their having the chestnut line above the black forehead very narrow. Zarudny has not made matters any easier by recording the typical form and *P. caspius* as winter visitors to the Karun district and afterwards (Mess. Orn., 1913) describing a new race, *menzbieri*, from the same district! According to him *menzbieri* has a *wider* frontal chestnut band than the typical race which *persimilis* certainly has not. There appears to be no proof that any *Anthoscopus* breeds in the Karun district.

60. Lesser Grey Shrike. Lanius minor.

Lanius minor, Gm. (Syst. Nat. I., p. 308, 1788—Italy).

This is a passage migrant in small numbers from Urfa in the north to Fao in the south where Cumming noted it as passing in March to May and again in September; most appear to pass through in the last half of April. It comes back again early, during the third week of August, and the passage lasts until the third week in September. Possibly some breed in Mesopotamia as Sassi records one from Pechabour near Mosul on June 1st. Zarudny says it nests in small numbers in the Zagros.

Specimens examined: ♀ Sheik Saad, 14-4-17; Tekrit, 17-4-19. (P. Z. C. and R. E. C.); ♂, Amara, 14-9-18 (P. A. B.); ♂ Basra, 20-8-19 (L. Home).

61. Great Grey Shrike. Lanius excubitor.

(1) *Lanius excubitor pallidirostris*, Cass. (Proc. Acad. Philad. v., p. 244, 1852—E. Africa).=*Assimilis* auct.)

(2) *Lanius excubitor aucheri*, Bp. (Rev. and Mag. Zool., 1853, p. 294—Persia)=(*fallax* auct).

The status of the Great Grey Shrikes of Mesopotamia is rather obscure; records refer to Grey Shrikes without discrimination of races of course, and some may even refer to the Lesser Grey Shrike, so that I must go almost entirely on skins. Of fourteen specimens examined three are *aucheri* and the rest *pallidirostris*; all were obtained in winter.

The Great Grey Shrike is probably a winter visitor, a few arriving in September, most of them early in October. Cheesman obtained *pallidirostris* at Shaiba on September 11th and Cumming got one at Fao also in September (erroneously recorded by Sharpe as *fallax*). All the others were got between October and February though Grey Shrikes are noted up to March 8th. They are widely distributed, singly and sparsely, inhabiting gardens but more especially thin scrub on the desert, or even quite bare desert. Of the 3 examples of *aucheri*

two were obtained in October and the third bears no date. It seems certain that some kind of Grey Shrike nests in the Mesopotamian plain. Pitman records it between Baghdad and Musejib from July 14th onwards frequenting telegraph wires near some gardens, and Logan Home says he found an unfinished nest at Samara, whilst Livesay took Grey Shrikes' eggs. I must here remark that it is perfectly useless taking the eggs of any Grey Shrike without obtaining the bird, and it may even be misleading.

Zarudny records *aucheri*, *pallidirostris*, and *assimilis* (which he considers to be distinct from the latter) as winter visitors to the Karun district and *pallidirostris* as a resident on the Zagros.

(1) Kumait, 27-2-18, 13-11-17, ♂ Amara, 16-12-17 (P. A. B.) ; Shaiba, 11-9-16 (P. Z. C. and R. E. C.) ; Shat-al-Adhaim, 3-10-17, 8-11-17 ; Baghdad, 31-12-17 (C. R. P.).

(2) Baghdad ; 10-10-17 (P. A. B.) ; Shat-al-Adhaim, 3-10-17 (C. R. P.).

Aucheri have a distinct but narrow frontal line of black, grey on the sides of the breast and a large wing spot and usually no pink tinge on the breast ; in *pallidirostris* the pink tinge on the breast is well marked as a rule unless faded, no frontal black, smaller or no wing spot, usually paler upperparts and a more distinct supercilium ; the young birds in winter have the grey of the back overlaid with a pale sandy colour and appear to lack the dark crescent markings most other races shew.

62. Woodchat Shrike. Lanius senator.

Lanius senator niloticus, Bp. (Rev. Zool., 1853, p. 439—White Nile).

This is a much earlier passage migrant in spring than the Masked Shrike and occurs in smaller numbers. Buxton first saw a few males at Amara on March 13th and after that date there are numerous records throughout the plains up to April 27th. The first autumn record comes from the oasis of Shaiba on August 9th and the passage lasts up to the middle of September, again no great numbers being recorded. Tomlinson in remarking that the species is not uncommon in spring says it also probably breeds up the Karun river as he saw it there early in June. Zarudny does not record it as nesting there, but says a few winter there ! Here again, as so often, our records do not at all tally with Zarudny's. Woosnam got one on the Shuteit River on March 8th. The status of this and other Shrikes in the breeding season requires further investigation. Zarudny says it breeds commonly in the Zagros.

Ten specimens examined : Amara, 18-4-19 (L. Hoome) ; Amara, 13-3-18 ; ♂, Basra, 19-8-19 ; ♀, Kurna, 17-3-18 (P. A. B.) ♂, Baghdad ; 19-3-18 (Harrison) ; ♂, Shaiba, 8-9-16 ; ♂. Sheik Saad, 5-4-17 (P. Z. C. and R. E. C.), 2. Feluja, 27-4-17 (C. R. P.) ; ♀, Basra, 17-3-18 (C. B. T.).

All are typical *niloticus* with much white at the base of the tail ; only in one does the white *not* extend beyond the coverts.

63. Masked Shrike. Lanius nubicus.

Lanius nubicus, Licht. (Verz. Doubl., p. 47, 1823—Nubia).

This species is a common spring and autumn migrant ; first few noted on April 17th at Tekrit and Urfa ; at Feluja and Amara a sudden and marked influx took place on the 23rd and for a fortnight it was quite common. It occurs throughout the region south to Fao. The return passage takes place at the end of August and lasts till the third week in September. Pitman noted that this Shrike was shy and retiring making all use of thick foliage for concealment, not a usual habit in Shrikes, and not universal with this species. Possibly a few pairs remain to breed in the plains as Buxton records it in the first two weeks of June at Amara and on June 17th saw a bird carrying food or nest material. Ward (*Field*, Jan. 18th, 1919) records it as common at Samara breeding in the scrub. Zarudny says it breeds commonly in the Zagros.

Photo Capt. W. Edgar Evans, 1918.

A.—Close to Amara, on Tigris.
"Borrow-pits" where earth for brick making, &c., is dug; old and new kilns in distance. Some of the faces where the Bee-eaters and Pied King-fishers nested in 1918 are seen to right and in distance. Average height 6 to 7 feet. All the surrounding land is a mass of the borrow-pits.

Photo Capt. C. R. Pitman.

B.—Broken country on Tigris down stream of Samarra where the Ruddy Sheldrake is found breeding in holes in the ground, mounds and cliffs during April and May.

Eleven skins examined : ♂, Basra, 19-4-17, : ♂, Sheik Saad, 31-4-18 (P. Z. C. and R. E. C.) ; ♀, Amara 23-4-18, 1-5-18 ; ♂, Baghdad, 12-9-17 (P.A. B.) ; Basra, 6-5 19 (L. Home) ; Feluja ♀. 23-4-17 (two), 27-4-17 (C. R. P.) ; ♂ Sheik Saad, p. 2-5-17 (Robinson) ; Baghdad, 7-9-17 (Ingoldby).

64. Red-backed Shrike. Lanius collurio.

Lanius collurio, L. (Syst. Nat. Ed., x., p. 94, 1758—Sweden).

The Red-backed Shrike is also a passage migrant in large numbers. The first few males arrive in the last days of March and small numbers are to be met with throughout April, but it is not until towards the end of the month and the early part of May that they pass through in any quantity, when they become very common and are widely distributed. The return passage begins in the last days of August and they quickly become common and soon pass on, our latest date being September 24th, though Cumming at Fao recorded it up to mid-November. Weigold found it common on spring passage at Urfa and remarks that of his numerous specimens some are typical *c. collurio,* some typical *c. kobylini* and four are intermediate. This latter race was named by Buturlin (Ibis, 1906, p. 416—Kutais in S. Caucasus) as Zarudny's name *fuscatus* for the eastern race was preoccupied, but I must point out that Zarudny in employing this name used *Enneoctonus* as the generic name, and that if this genus is used for the Red-backed Shrike, as it is by some, Zarudny's name must be upheld ; if however *Lanius* is preferred then Buturlin's name should stand. On points like this, and they are always arising, there can never be any uniformity of nomenclature or finality, unless every one agrees on the limitations of genera !

This supposed eastern race is said to differ in the rather paler and restricted amount of the chestnut colour of the mantle. As Weigold remarks one often cannot measure this as it is quite indefinite where the colour begins and ends, and as he says some are intermediate. The truth is *kobylini* is a thoroughly bad race !

I have examined six spring males from Kutais, Caucasus and North Persia and about eight spring males from Mesopotamia (which one may suppose should also belong to this race), together with a large series of European males and I find that the shade of the chestnut colour and its width vary very much both in eastern and European examples ; it so happens that in the Kutais birds it is broad ! and in the Caucasian bird very dark ! I cannot see any distinguishing character between birds from the east and west ; the bills too vary very much in size throughout the range of the species.

Seventeen specimens examined ♂ ♀, Amara, 7-5-18, ; ♂ ♂, Baghdad, 31-8-17, ♂, 24-9-17 ♀, Amara, 6-5-18, 16-4-19 (P. A. B.) : ♀ ♀, Fao, 10-5-18 (Armstrong) ; ♂, Feluja, 24-4-17, ♂, 21-4-17, ♀, 23-4-17 (C. R. P.) ; Basra, 6-5-19 (L. Home) ; Tekrit, 17-4-19, ♂, Sheik Saad, 10-9-17 (P. Z. C. and R. E. C.) ; ♂, Sulimania ; 2-9-17 (Ross).

65. Red-tailed Shrike. Lanius cristatus.

(1) *Lanius cristatus isabellinus,* H. and E. (Symb. Phys. fol. e. Anm., 1828—Gonfode in Arabia).

(2) *Lanius cristatus phœnicuroides,* Schal. (J. F. O., 1875, p. 148—Tschimkent).

The two races were naturally not identified in the field and records are scanty ; judging from specimens obtained *isabellinus* is a common winter visitor arriving during the last ten days of September, though one or the other form occurs at the beginning of the month. It frequents thorny scrub or gardens singly, or two or three in near proximity ; it leaves again somewhat late in the spring (the latest specimen is April 29th), completing its body moult in February and March before departure.

All the specimens (six) of *phœnicuroides* were obtained during the spring and autumn; Pitman noted that Red-tailed Shrikes were abundant in the Adhaim area in the first ten days of October and after that only a few were seen; three specimens he obtained about that time were *phœnicuroides* and as no specimens were got between October 12th and early April, during which period 8 specimens of *isabellinus* were obtained, it is extremely suggestive that the former is only a bird of passage—as I know to be the case elsewhere. Since all Red-tailed Shrikes were found commoner in spring and autumn, *isabellinus* may too be in part a passage migrant. *phœnicuroides* was obtained at Fao as late as May 25th; it nests in the Zagros according to Zarudny. From a specimen of *isabellinus* I took a parasitic worm from under the skin behind the eye, a situation I have often found similar parasites in *collurio*. Dr. Manson Bahr informs me this is a *filaria* and the intermediate host is the feather louse.

Zarudny goes to far extremes in the recognition of racial forms and in some cases at all events his "races" are nothing but individual variations; this "oversplitting" and lack of proper conception of what a racial form is brings this important part of ornithology into disrepute (there are still some who "do not believe" in the existence of the most obvious subspecies), and moreover gives an infinite amount of unproductive and needless toil to those who later work in the same field; work which in some cases is impossible as his specimens are ungetable in Tashkent and many of his descriptions are written in Russian! His treatment of the Red-tailed Shrikes is a case in point. These Shrikes throughout their range divide into five fairly well marked races, two of which only concern us—*phœnicuroides* and *isabellinus* (both of which vary somewhat individually). These two Zarudny makes into full species:—*isabellinus* with two races, *speculigera* and *salina*; and *phœnicuroides* also with two races *caniceps* and *varia*—all six forms to be found in Persia and all except *varia* and *salina* inhabiting the Karun district in winter!

(1) Eighteen specimens examined: ♂, Amara, 25-10-17, 25-4-18, 26-10-18, 1-12-17, 5-1-18; ♂, Baghdad, 21-9-17; L. Akkarkus, 12-10-17; Ezra's Tomb, 23-2-18 (two) (P. A. B.); Abed, 9-2-18 (F. M. B.) Kamisiyeh, 7-1-17 (Aldworth) Feluja, 24-4-17, 29-4-17 (C. R. P.); ♂ ♀, Basra, 21-11-17 (C. B. T.); ♀, Sheik Saad, 31-3-17; ♂, Kut, 1-10-18 (P. Z. C. and R. E. C.); Gurmat Ali, 26-9-20.

(2) Five examined: ♂, Fao, 25-5-18 (Armstrong); ♂, Sheik Saad, 4-4-19 (P. Z.C. and R. E. C.); Adhaim, 2-10-17, 12-10-17, 27-9-17 (C. R. P.).

One *isabellinus*, 25-10-17, has much juvenile plumage still present. It rather resembles juvenile of *collurio*, but the tail is longer and there is no white on the outer web of the outer tail feathers and it is paler grey on the back.

(*To be continued.*)

FURTHER LIZARDS AND SNAKES FROM PERSIA AND MESOPOTAMIA.

BY

JOAN B. PROCTER, F.Z.S.

Since the publication of Mr. Boulenger's lists of the Snakes and Lizards collected by the Expeditionary Forces in Mesopotamia[1], further material has been received from Capt. H. E. Shortt, I.M.S., and Capt. W. E. Evans, R. A. M. C.; Mr. Kinnear has therefore asked me to write the following addendum, in which species marked with an asterisk were not recorded by Mr. Boulenger.

Besides snakes and lizards, which are the subject of this paper, the following were included in the collections :—*Clemmys caspica* (Capt. Evans), *Bufo viridis* (Capt. Evans) and *Hyla arborea* var. *savigni* (Capt. Shortt and Capt. Evans).

LACERTITIA.

GECKONIDÆ.

1. *Alsophylax tuberculata,** Blanf.

Jebel Hamrin, N. E. of Baghdad (Capt. Evans).

One specimen, well marked with alternate, curved transverse bands of light and dark grey; lower surfaces speckled with grey.

Habitat : Mesopotamia, Southern Persia, Baluchistan, Sind.

2. *Phyllodactylus elisæ,** Werner,

Kuretu[2], Persian frontier (Capt. Shortt).

Three specimens of this rare gecko. They show considerable variation in the proportions and arrangements of the mental and chin-shields. In the case of the first specimen the mental is moderate, followed by two pairs of chin-shields, the first pair in contact in the middle for a distance equalling half their length, as in the type-specimens; in the second the first pair of chin-shields are only in contact for about one-quarter of their length, the mental shield being larger in proportion ; in the third specimen the mental is enormous, followed by a single pair of large triangular chin-shields, which are not in contact with each other.

This amount of variation is very unusual , were it not for the intermediate form one might consider the third specimen to be a distinct species. The first specimen is almost white ; the other two are thickly speckled with very dark brown.

Habitat : Mesopotamia. Capt. Shortt tells me that he caught these geckos in natural caves formed by overhanging rocks. The types are from the ruins of Nineveh.

3. *Hemidactylus persicus,** Anders.

Baghdad (Capt. Shortt), Amara-on-Tigris (Capt. Evans),
Three specimens

Habitat : Mesopotamia, Persia, Sind. A new Record for Mesopotamia.

4. *Hemidactylus flaviviridis** Ruppi.

One specimen from Amara (Capt. Evans).

Habitat : Arabia, Persia, Baluchistan, India and Malay Peninsula.

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[1] Journ., Bombay Nat. Hist. Soc., xxvii, No. 2, pp. 347-353 (1920),

[2] Also spelled Quritu or Quraitu.

AGAMIDÆ.

5. *Agama persica*, Blanf.

Two specimens from Amara (Capt. Evans).
Note by Capt. Evans:—

"This lizard had the power of producing the purple-blue colour under its face and neck, and along its sides; or of losing the colour entirely, except a faint rusty tinge on the sides only. The change could be accomplished in a minute or two. I had it alive for some time."

Habitat: Mesopotamia, Persia.

6. *Agama nupta*, De Fil.

One specimen from Jebel Hamrin (Capt. Evans).
One specimen from Kuretu, (Capt. Shortt).
Var. *fusca*,* Blanf.
One specimen, ♂ from Kangavar (Capt. Shortt).
This specimen must be regarded as var. *fusca* on account of the great development of the spines on the head and neck, and the indistinctness of the nuchal fold. Its colouration is different from the true *fusca*, being dark grey, mottled with black on the neck and shoulders; throat black instead of yellow; enlarged dorsal scales greenish grey.

Habitat: Mesopotamia, Persia, Baluchistan.

7. *Uromastix loricatus*,* Blanf.

One specimen from Ruz, N. E. of Baghdad (Capt. Evans).
Habitat: Mesopotamia, Persia.

A new record for Mesopotamia.

LACERTIDÆ.

8. *Acanthodactylus scutellatus*, Anders.

One specimen from Jebel Hamrin (Capt. Evans).
Habitat: Senegambia, North Africa, Somaliland, Sinaitic Peninsula, Syria. Mesopotamia.

9. *Ophiops elegans*, Mén.

Var. *ehrenbergii*, Wiegm.
Four specimens, from Kuretu, (Capt. Shortt).
Five specimens from Jebel Hamrin, Kizil Robat, and Abu Sidra on Tigris (Capt. Evans).
Habitat: Constantinople and Tripoli to N. W. India.

10. *Eremias velox*,* Pall.

Var. *persica*, Blanf.
One specimen from Kuretu (Capt. Shortt)
Habitat: Mesopotamia, Persia.

SCINCIDÆ.

11. *Mabuia vittata*, Oliv.

One specimen from Amara (Capt. Evans).
Habitat: Algeria to Mesopotamia.

12. *Mabuia septemtæniata*, Reuss.

One specimen from Kuretu (Capt. Shortt).
Two from Amara (Capt. Evans).
Habitat: Erythrea to Transcaspia and Sind.

13. *Ablepharus brandtii,* Strauch.

Five specimens from Amara, and three from near Kizil Robat, N. E. of Baghdad (Capt. Evans).

Habitat : Tunisia to Transcaspia and Baluchistan.

OPHIDIA.

Colubrinæ.

14. *Zamenis ventrimaculatus,* Gray.

One young, Baghdad (Capt. Shortt).

Two young from Amara (Capt. Evans).

One from Amara has the præfrontals fused into a single shield.

Habitat : From the Euphrates to Kashmir and N. W. India.

15. *Zamenis ravergieri,** Mén.

One specimen from Kerind, Persia (Capt. Shortt).

This individual is jet black above, dark grey below, uniform.

Capt. Shortt says of it:—"Taken sunning itself in midwinter when the ground was covered with snow. I have seen the same snake also taken at Fatha Gorge on the Tigris."

Habitat : Transcaucasia, Mesopotamia, Persian Transcaspia, Turkestan, Afganistan.

16. *Contia collaris,* Mén.

One specimen from Tak-I-Girreh, N. W. Persia (Capt. Evans).

Habitat : Caucasus, Mesopotamia, Persia.

17. *Contia persica,** Anders.

Two specimens from Kizil Robat and Jebel Hamrin hills, N. E. of Baghdad (Capt. Evans).

This rare little snake has not been recorded from Mesopotamia before.

Habitat : Mesopotamia, Persia.

REVIEWS.

SMALL GAME SHOOTING AROUND OOTACAMUND.

BY

"Rolling Stone."

(The Ootacamund and Nilgiri Press. 8 as., postage extra.)

A nineteen page pamphlet giving some tips intended to assist the devotee of the scatter gun who is a stranger to Ooty, in finding his quarry.

The subject is but lightly touched upon as is to be expected from the limited size of the work. The general advice given appears to be sound if not very exhaustive. Quail are not mentioned though hardly uncommon. The pigeon referred to on page 17 is obviously the Nilgiri woodpigeon (*Alsocomus elphinstonii*) though we are not told so. Personally, I consider this woodpigeon to be an infinitely finer game bird than the jungle fowl, spur fowl. etc. It offers far prettier shots and calls for the highest quality of marksmanship. This is more particularly true if the bird be walked up through the sholas, though even as a driven bird it gives good sport. Finally it should *not* be put in a pie but served on toast! Though one cannot help regretting that this little work was not considerably expanded, it is well worth the price to those for whom it was written. The author mentions under the heading "Conveyances" that "a pony can be hired in the bazaar" but very wisely adds "it is scarcely worthwhile hiring". The complete sportsman setting out from Ooty on a bazaar tat would be a refreshing novelty!

THE WATER FOWL OF INDIA AND ASIA.

BY

Frank Finn, B.A. (Oxon), F.Z.S.

(Third Edition, published by Thacker Spink & Co.)

A previous edition of this excellent little book has accompanied me on many duck shooting expeditions and Christmas Camps; where, if not already known to my companions or hosts, it has always been very favorably commented upon.

It has never been my good fortune to test the description of one of the rarer ducks; but we have got as many as ten species in a day and have always found the descriptions and illustrations an easy guide to any species of which there is a doubt.

The third edition is serviceably and artistically bound and can be easily carried, where the larger and more expensive books would only be a nuisance. The book does not pretend to give a comprehensive description of the various water fowls, but as a shooting camp companion it will be much appreciated.

EDITORIAL.

Since the last editorial was published at the end of July—and it was written several days before it appeared in print—a good deal has happened which is of interest to members.

First perhaps is the fact that a statement made in that editorial has turned out to be absolutely incorrect and the editors rejoice at their fallibility ! We wrote last July " We cannot look to Government for financial help (for the Mammal Survey) though it is work for the good of India we are doing.... Perhaps it may be possible when the Finance member has not to budget for a deficit of eighteen crores, but if we wait for that happy day we shall never be able to finish the Mammal Survey in time for the New Volume (Mammals—Fauna of British India Series, New Edition) ".

Well, the happy day for the Finance Member has not arrived but the Society has been granted a donation of Rs. 22,500 for the year 1921-22 for the services of the Mammal Survey and a similar sum will be budgeted--and we trust voted—for 1922-23. We believe that two factors weighed heavily in the scale in our favour. One was the fact that out of a total sum of Rs. 1,07,000 subscribed since 1911 to the funds of the Survey only Rs. 37,500 had been subscribed by various Governments in India and that out of this small proportion only Rs.7,500 had been provided by the Government of India. Speaking in connection with quite a different matter the President of our Society (His Excellency Sir George Lloyd) stated " Government will help those who help themselves " and a Society which could help itself as ours had done evidently deserved help as it is good to encourage private effort to do what otherwise Government would have to do. How rare it is for private enterprise to undertake such work and to relieve Government of the task was pointed out by Mr. Oldfield Thomas, and his remarks were we believe the second factor which weighed with the Financial Committee of the Legislative Assembly and with the members. When applying for the grant the Honorary Secretary quoted Mr. Oldfield Thomas' remarks which were as follows :—

> " The work already carried out by the Bombay Natural History Society is unique, in that it is the sole instance on record of such a Survey having been carried out by a private Society with very little help by Government. The only other systematic Survey of the Mammals of a country is that made of the Mammalia of the United States. This was made at the sole cost of Government."

The grant from Government does not do away entirely with the necessity of further help from members and we are glad it does not as the need of the Survey has enabled some of our old members to show that though they may be some considerable distance from India they are still as keenly interested in the Society as in their young days. His Excellency the High Commissioner for Mesopotamia, Sir Percy Cox, who has done so much for the Society in Mesopotamia and the Coasts and Islands of the Persian Gulf, offered to contribute Rs. 1,000 a year for three years to the Funds of the Survey in the hope and belief that others would follow his example. His trust was not belied. Two Life Members at home and one out here have already guaranteed similar sums and after publication of this Journal we confidently look for many more.

The grant for the Prince of Wales Museum has at last been sanctioned by the Local Government and though not yet paid Rs. 40,000 will in due course find its way to our Treasurer and enable him to satisfy partially—and we are afraid very partially—the importunate demands of the Curator. The grant for the Museum would however have reached us too late to enable us to arrange, in time for the Prince's visit, the portion of the Museum wing placed at our disposal by the Museum Authorities. Fortunately the Prince of Wales' Reception Fund made

us a grant of Rs. 2,000 and the Museum Trustees advanced Rs. 3,000 and with these sums our staff set energetically to work to arrange in new surroundings the old and interesting trophies of the Society. We are certain that the collections will interest the Prince but we wish we had with us that Prince of Museum story-tellers, H. M. Phipson, who could make every exhibit tell a story, and a good one at that. However the pains our Curators are taking and the interest many of our members have shown in the work will, we are confident, result in the prince's enjoying his visit to the Natural History Society's Museum.*

In connection with His Royal Highness' tour we are pleased to record that Mr. B. C. Ellison,our Curator, has been selected to accompany His Royal Highness on his visits to Mysore, Bhopal and Nepal Terai in the capacity of Naturalist. We hope to receive the permission of His Royal Highness to publish an illustrated account of these shoots in our Journal.

Coming back to the subject of the Mammal Survey, we regret to report the illness which has, we trust but temporarily, incapacitated Mr. Wells and which at one time endangered his life. Mr. Wells' labours in Assam and its Borderland resulted not only in the collection for the Society of a valuable series of mammals but also in the collection by him of the Malaria parasite in his system. After a spell of some weeks in Hospital in Calcutta Mr. Wells considered himself fit enough to proceed to the Chilka Lake District but the willing spirit tried too much and a serious attack of Malaria at Nayagarh State has necessitated Mr. Wells' return to Hospital. He has worked since September 1919 in Assam and a change to a healthy climate is undoubtedly desirable. We hope that he will soon be strong enough to continue Survey work and recuperate his health in the healthy tracts of Central India where, through the generosity of H. H. The Maharaja Scindia, we hope to make valuable collections.

Mr. Primrose has settled down to vigorous collecting in the Mergui District undeterred by the heavy rains. His letters will help those who write the Scientific Reports on the work of the Mammal Survey to make their papers interesting to the non-scientific reader as well as to the scientific one.

Mr. Riley O'Brien is still in the Palni Hills and after the Prince of Wales' visit to the Terai, the Society's Indian collector will return to Nepal.

An interesting suggestion has been made to us by one of our members, Capt. T. R. Livesey of Kotah, and we are sure he will not mind our boldly transposing his letter almost in extenso to these pages. He writes :—

" I have been meaning to write to you on the subject of collection of skins of Birds in India. At present there seems to be no method in it and stray "Ornithologists " in different parts of the country slay any bird they consider rare which is hardly the way to encourage such species to extend their range ! and is of course abhorrent to any lover of Nature.

"Could you not co-ordinate and regulate such collecting, calling through your Journal for exactly what you want and discourage, even prohibit, indiscriminate slaughter of rare and beautiful birds ?

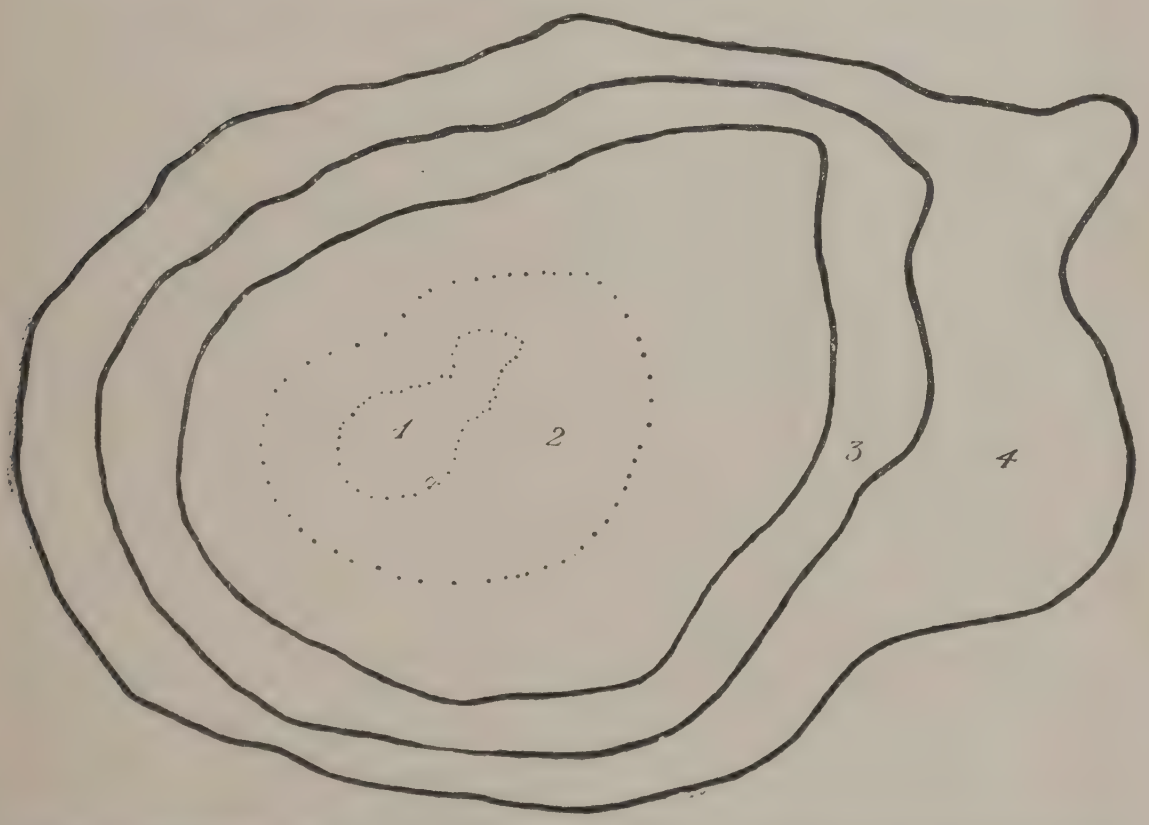
"Here is a diagram we will suppose of the geographical distribution of a species of Indian Bird—as at present known. I suggest after having obtained a typical series of skins, male, female, young, summer and winter plumage say of the species—the further collection of skins should be stopped except where needed—for in addition to the type you may require specimens from N. E. S. and W. to place the limit of distribution and to ascertain any variation in plumage, etc. Then extreme types from the boundaries of distribution should be collected in the areas marked 1, 2 and 3 and not along the outermost circle for therein the bird is presumably rare and trying to extend itself.

* The Royal visit to the museum was unfortunately cancelled at the eleventh hour.

"When the required number of skins from the areas **1, 2 and 3** have been acquired the fact should be published so as to prevent anyone sending in others. Within the area marked 4—none should be shot—*but there is no objection* to ornithologists *reporting it.*

"Natural History Societies and Museums as a rule pay no heed at all to *reports* of birds being seen—unless their dead remains are sent along—this encourages the useless killing of birds rare in that locality and harms the species.

"Your *wants* might be published in the Journal under—



1—Centre of distribution from which the type skins come and in which the bird is most numerous probably.
2—The species is fairly common in this area.
3—Area in which bird is only seen on occasions and from which a limited number of skins are required.
4—Area in which it is rare if present at all and in which it must not be killed.

(A) Skins,

(B) Information regarding the species in question,

and also, as important as your *wants*—your "*don't wants*" which will save the lives of rare birds and the 'collectors' some trouble."

In a subsequent letter Capt. Livesey elaborated a scheme to effect the desired purpose on the following lines :—

The publication by the Society—say four times a year, of 12-15 special map diagrams. The information given on the map would record as far as possible the information already possessed, gleaned from the pages of the "Fauna" "Ibis" and this Journal, and state the information required by those working on Birds either out here or at the British Museum.

These booklets would be sold to members so that the expense to the Society would not be great. To many members they should be an attraction and at the end of the year should see the return to the Society of a great mass of material. Here a difficulty presents itself as pointed out by Capt.

Livesey. Can the officials of the Society—already rather over-burdened with work—find the time to collate and sift all the information obtained and publish annually a fifth booklet giving the results obtained from the issue of the previous four ? We doubt if, with the size of our staff limited by necessity to the meagre size of our purse, we could undertake that such revising work would be done by our staff, but in the old days of the Society we used to rely, and in the present days we still rely, on the help of members of the Society who are specially qualified in any particular subject and we see no reason why with the assistance of so many ornithological members of the Society we should not undertake the work.

Now as to the practicability of the foregoing ?

The above remarks may hold good for a country like England where the area is comparatively limited, and where there are a comparatively large number of people who take an intelligent interest in Natural History, and there are many Field Clubs and other associations which go in for observing Bird Life. Out here in India, conditions are on a different scale. Firstly there are few Natural History Societies; the number of Bird skins obtained by these Societies from their individual members or by the various Museums is an almost negligible percentage of the number shot. Further the number of individual collectors who go in for systematic collecting and who are able to recognise and identify the different species correctly is extremely limited. How many men we wonder are there in the whole of India who are interested enough to undertake work on the lines suggested ? The best method of bird protection is the law against the export of plumage, which, though it is evaded often, is a deterrent against the indiscriminate slaughter of bright plumaged birds, etc. The large majority of our members merely take a sporting interest in the subject and most of the skins sent us for identification are common game birds. Therefore apart from the skins obtained by our collectors from areas where they are wanted the collecting of bird skins by members of the Society is not likely to effect the issue We may be wrong and we shall be glad to hear from members on the above subject and if the scheme is popular we hope to start it next year. We are not reproducing the suggested map here but will send particulars to members interested in the idea.

The series of papers on the Fauna of Mesopotamia and parts of Persia are now almost completed and it will not be long before they are published in book form. This has been made possible by the foresight of the Mesopotamian Government which, realising the necessity of such a publication and the expense a separate publication would entail, arranged with the Society that 1,000 extra copies of each paper should be printed off as issued and kept until such time as the whole series was completed and the different papers could be bound together in one whole. We take this opportunity of expressing our thanks to the authors of the various papers and to the members of the Society whose exertions in a difficult country, within a sphere where War operations were active, made the writing of the papers possible and provided through the medium of our journal such a mass of new and valuable information on the Natural History of Iraq.

It is with great pleasure that we issue in this number the first of a series of popular papers by Col. Ward on the Game of Kashmir. Col. Ward is one whose knowledge of Natural History in Kashmir is unrivalled and who knows how to convey his knowledge in a way which interests his reader and encourages in him the desire not merely to read more and more about the delights of a Shikari and Naturalist in Kashmir but to partake himself of its actual pleasures.

Readers of the Quarterly Review who remember the delightful article which appeared in the issue for July 1920 will be glad to know that the next number of the Journal (to be issued we hope in January) will contain a paper by Harold Russell on Indian Parasitic Flies. Mr. Russell in his last letter writes

" It has proved a much bigger work than I expected. I am well satisfied with " the result because it puts together in readable form a lot that is not other- " wise accessible which has not yet been attempted so far as I know. I have " discovered how little is known about the India Diptera ! "

We want articles for our Journal on Fishing. The article in the last number on the History of Trout Fishing in the Nilgiris has stimulated our interest. Col. Ward will write for us on Fishing in Kashmir and we have hopes of contributions from other keen and experienced fishermen. Since Mr. Comber left Bombay, the Bombay Anglers Association, so far as the issue of its Journal is concerned, is to all appearance dormant, and this Society's Journal offers the best opportunity to anglers to discuss and ventilate their wants and to ensure that the dimensions of their fish are faithfully recorded.

It is with deep regret that we record the death of Mr. John Wallace, a member of the Committee of this Society since 1901. An account of Mr. Wallace's life appears on another page. His death removes yet another of the old band which used to work in the Society's Rooms in Apollo Street. Some have been taken by death—others we are glad to say enjoy their well earn retirement in England. Is there no one amongst us who will not—while there is time—write an account for us of those old days and those old workers E. H. Aitken, R. A. Sterndale, G. W. Vidal, I.C.S., Father F. Dreckmann, A. Abercrombie, L. C. H. Young, Col. Kirtikar. Ought we not to prepare well in advance for our Jubilee and when that comes what is above all things necessary ? Is it not that we should praise famous men and our Fathers who begat us ? But how are we to do so if we have no memories of them ? The Society has several volumes of photos of animals and other denizens of the jungle, but is entirely lacking in photos of those *Homo sapiens* who founded and nursed and worked for the Society. May we appeal to those who have photos to send them to us, and may we appeal to those who know and possibly worked with these old friends to send us word portraits of them ?

The Hanging Wall Charts showing how to distinguish between poisonous and non-poisonous snakes have proved a great success, but the small pocket charts specially designed for our members' use hang fire so far as sales are concerned. Why we cannot say. Perhaps members have not realised their value. Let us hope they will now.

Just as this Journal is being issued from the Press, we learn that the long expected copies of Stuart Baker's Game Birds are on their way out to us and we hope the original subscribers will receive their copies about the same time as this Journal. Although the subscription list is closed and copies are no longer obtainable at the very low subscription rate, members can obtain copies from the Society at a discount off the published price.

OBITUARY.

It is with great regret that we announce the death which took place in Bombay on the 9th October 1921 of Mr. John Wallace, C.E., who joined the Bombay Natural History Society as a member in 1891 and who was elected a member of the Committee of the Society in 1901, a position he occupied until his death.

Educated at King's College, London, Mr. Wallace worked for some years in important engineering firms at home and gained a thorough experience of machinery of all kinds. He subsequently went to Cairo as Chief Engineer of the Egyptian Railways. During the Egyptian Expedition of 1882, he volunteered his services to the Military authorities and was appointed by Lord Charles Beresford Chief of the Fire Brigade during the burning of Alexandria when his knowledge of local conditions and familiarity with fire appliances proved of great value to the Military authorities. For his services he received the Silver Medal and Bronze Star of the Egyptian Expedition of 1882 and the Order of the Mejidieh from the Egyptian Government.

In 1886 Mr. Wallace came to India and after designing the water works at Cawnpore and mill buildings at Aurungabad, Gadag and Ahmedabad settled down as an Engineer in Bombay and since 1893 was joint Editor of the Indian Textile Journal.

Mr. Wallace specially devoted himself to the designing and making of the simpler and cheaper appliances for handicrafts suitable for the average Indian workman, and in this connection he rendered valuable services to the workshops of the School of Arts in Bombay which he improved and remodelled considerably while serving as Acting Principal in place of Mr. Cecil Burns.

In this connection however he will perhaps best be remembered as the inventor and prime-mover in the idea which has developed into a flourishing little industry, namely, the teaching of women to make beads out of the hard and various coloured seeds which ordinarily fall ungathered in the jungles, and to make up these beads into chicks, necklaces, curtain loops, hat-pins and many other ornamental articles for which a good demand might be expected.

The seeds most suited to this purpose being very hard and of irregular shape and size, it was by no means easy to devise an apparatus for drilling them which should be both cheap, simple and efficient, but after a good deal of experiment a drilling machine was evolved of the simplest kind—and we may say of the cheapest as it was made from an old packing case ! Its efficiency was proved by the fact that work came in too fast for it, and it was supplemented by a long table furnished with six drill heads, the whole of which are driven by one cord, a coolie providing motive power.

Only in India could be found such a rich variety of seeds, brown, black, yellow, red, white and olive, suited to the work. The rich brown Gharbi bean of the size ot a watch, combines with the Rudraksha nut (sacred to Shiva) in a very handsome loop for heavy curtains, and the gul mohr, the scarlet wild liquorice, wild grass, acacia, soapnut, cana, moonflower, Lushai bean, Singara, gall nut, fever nut and many others are worked up into a series of beautiful articles which received their full share of appreciation in the Forest Department of the Industrial and Agricultural Exhibition held in 1904 on the Oval at Bombay.

The Mother Superior of the All Saints Home at Mazagaon, where the industry was established, writing to the Honorary Secretary of the Society after Mr. Wallace's death, said " All through—and up to within a few days of his death, he showed the greatest interest in its development—he was constantly suggesting new

ideas, or helping us to overcome difficulties, his manifold technical skill was placed untiringly at our service.

We lose in him a most sympathetic friend as well as an efficient and valuable supporter."

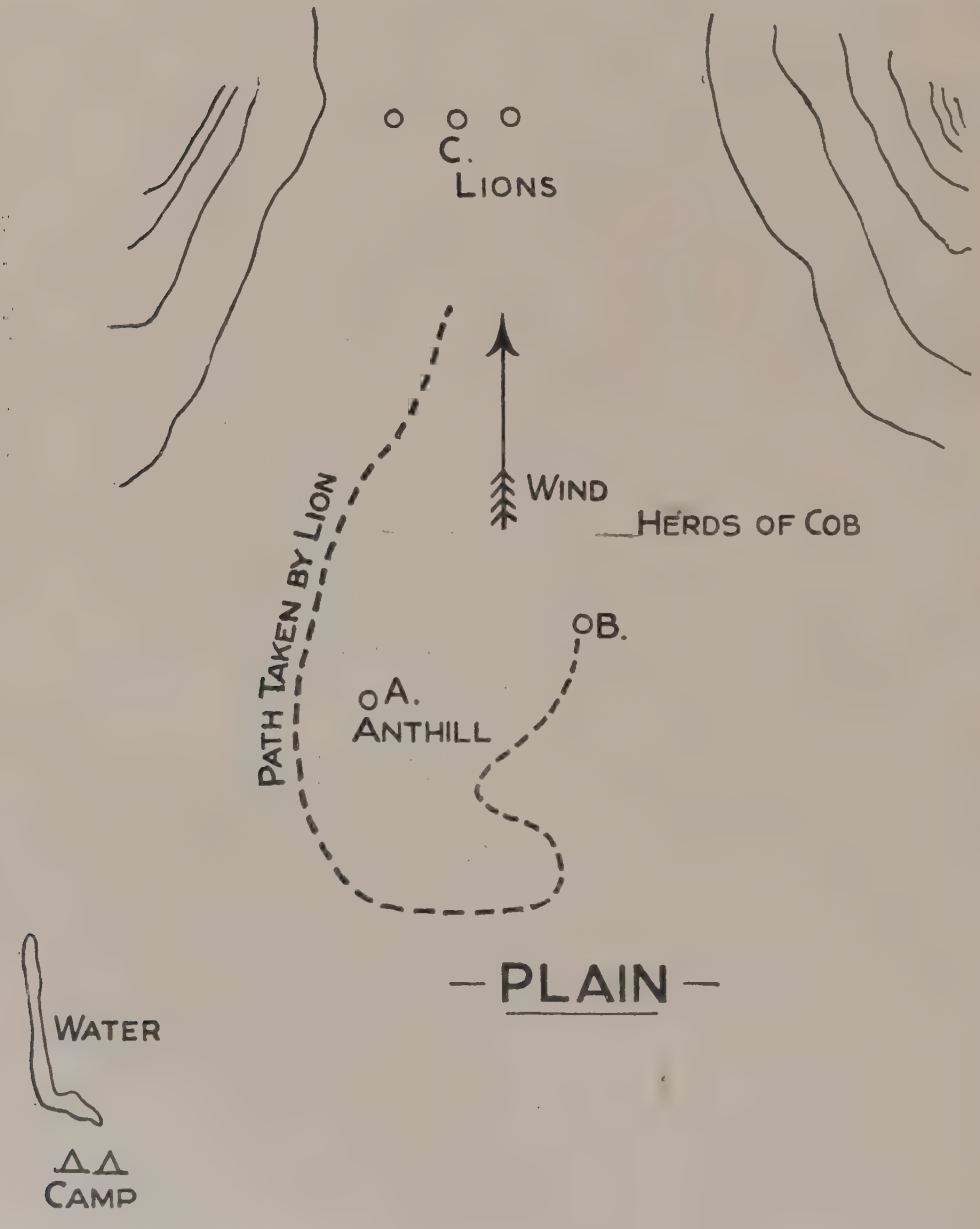
It is as a sympathetic friend and an efficient supporter that John Wallace will be best remembered by fellow members of the Committee and attendants at the Society's—now alas infrequent "At homes". A most regular attendant he shewed a keen interest in all exhibits and papers placed before the meetings.

MISCELLANEOUS NOTES.

No. I.—THE POWER OF SCENT IN WILD ANIMALS.

In Volume XXVII, No. 1, there is an article by E. C. Stuart Baker "on the power of scent in wild animals" and although I know very little from personal experience about the ways and habits of Indian Fauna, experience gained in other parts of the world causes me to burst forth on this fascinating subject.

First might I say that I am of the same conviction as the writer of the article, in fact I go further, contending that beasts depend not only when



hunting but also for protection on their powers of hearing and sight ; to say however that they never use the power of scent would be a mistake, as this possession is used, or shall we say attempts are made by this means, to gain information, but the animal seems to be adrift. I know such opinions are all wrong to the armchair naturalist or museum scientist, but the instances put forward by Mr. Stuart Baker are worth more than all our home gasbags put together even if they were multiplied a hundredfold.

I know it is no use my laying down the law without giving facts, so here are a few experiences :—

The Lion.—I was on " Safari " in Muri Province, Northern Nigeria, one early morning, moving through small elephant grass about 10 to 12 feet high and going down wind (of a force of about 12 miles per hour) when my old tracker (dot and carry one) murmured softly " Ziki Baturi." After a few words of argument I took the express and went forward softly for about 40 yards to where the grass stopped and halted in amazement at the sight of 5 lions strewn round the carcase of a Roan in artistic positions at a distance of no more than 20 yards. I was so surprised that putting my hand to my pocket, in which I always carry a small bag of flour, I tested the wind. The lions were not upset at all nor even had they any suspicions, and it was not until I stepped out in full view that interest and hurried life came on the scene. The resultant slaughter does not effect the question at all.

Another example.—This time in a very far away country to the north of Uganda where game animals had never had a modern gun fired at them and herds of waterbuck, kob, zebra, etc., stood to gaze at one, full of curiosity.

I was out on a big plain teeming with Kob (*Cobus coba thomasi*) as far as the eye could see about 1-30 a.m. on a glorious moonlight night, as Colonel Glasford calls it " Ghooming " shod with very thick rubber soled boots. Finally taking up the position (*A*) behind an anthill I sat quietly smoking, drinking in the glorious beauty of the scene, when some hidden sense caused me to quietly look round to my left where I saw a lion coming up wind about 80 yards away, quietly and without any fuss just like a dog trotting down a lane at home. The lion took the dotted path as shown in the diagram, passing me at thirty yards until he arrived at (*B*). By this time I was very curious indeed to discover the whys and wherefores. The lion waited at (*B*) for quite a time, ten or twelve minutes, until I heard a cough between the hills. Our lion then got up and deliberately walked down wind (I following) full in the open on to the Kob which bolted down wind and were rushed by three lions, at about the place (*C*). The hunting was successful as two Kob were pulled down. Our lion then joined up after a friendly scap with a lioness and the two set to work on the one carcase, but the other two, both lionesses, did not eat together. I did not see the actual pulling down on this occasion but I have done so on other occasions and although it is most difficult to get a proper idea, owing to bad light and the quickness of the operation, what occurs seems to be that the lion rushes the prey, seizes it by the neck with its mouth whilst it hurls its force by impact on to the shoulders of the animal giving the neck a wrench round. The whole business, done so quickly, breaks one of the neck vertebræ, death being instantaneous.

African Buffalo.—Here I am on delicate ground myself as scent does play a part, but not the sole and only part our gas bag friends would have us believe.

The first instance was with *Bos caffer branchyceros* or the Lake Chad variety of the Congo Desert species. This gentleman is small for his long name but makes up for this by having a nature truly Corsican as when he is roused it is war to the death, aggressive and defensive. The country is a nightmare for the sportsman as only those can realise who have crawled after buffalo into their strongholds.

The buffalo in question had been hit badly, but rather far back, about 6-30 a.m. and had promptly gone for cover, so, giving him plenty of time to stiffen, I went

after him by myself as although I may be a fool I never allow a native retainer to be a fool at the same time. One fool is quite enough on such an occasion. So about 11-30 a.m. saw me crawling down a tunnel like track following good-looking blood spoor. This I did for two hours with what little wind there was behind me. About this time I missed the spoor and took a wrong turn. Finding out my mistake I returned until I could just see the fork, so lay down behind an old fallen tree to wipe my steaming face, as it is hot in these places. After a bit I was electrified to hear the blowing of my friend,with a corresponding hammer of my heart, and after a wait the buffalo came along the main path I had used sniffing and blowing steam from his nostrils along my very spoor. He came to the fork 30 feet away, sniffed, then went along the main track. Whilst trying to see him through the undergrowth I must have made a noise as the resulting charge crashed me over, and the ensuing ten minutes, with two ribs broken and a shoulder dislocated before the buffalo finally went under, has taught the writer a few things about being a fool. Now if that buffalo had had a proper sense of scent he would have picked my spoor up the side track. He did not but went straight on. I move, and am promptly charged, located exactly and instantly by the power of hearing.

It might bore you to hear more about *Bos caffer* so I will proceed with.

The Rhinoceros, the clown of the animal world. Time and again when photographing this animal I have gone down wind, up wind, any wind so long as I kept his stern in front of me and wore rubber soled boots,—but let his small pig eyes or ears see or hear me then it was hopeless.

The Elephant.—To my mind the elephant is an animal with the sense of scent most developed and this I think is due to evolution, a subject which causes more bad language than beer.

There is another absorbing subject, *i.e.*, a study of the senses shown by *The Crocodile*, a reptile. I have always been keen to watch but as all my experiences have been with the African brute they might not be of interest to members of an Indian Natural History Society, but I can assure you crocodiles will reward any man who has the opportunity to watch them.

The Wild Goat and the Jailan.—Then take the wild goat (*Capra hircus*) and the Jailan or Red Sheep (*Ovis orientalis gmelini*) of the Bos Dagh Range, Asia Minor. They depend solely on sight alone.

One example I can give was whilst shooting on the Bos Dagh Range. We had had a long day after the oldest and most cunning of all the tribe of big sheep, until I was well-nigh finished. I was sitting in the snow telling myself what a fool I was to go miles and miles after a poor sheep when I could buy a head in Konia any day, when a hiss from Mehemet, my brigand guide, brought me flat in the snow behind a tuft of grass. I remember thinking how my stern limbs must be looming up on the horizon when an old ram with five ewes came along stepping in my own spoor which lay along the snow covered plateau plain to the whole world. The sheep came along in single file and did not even sniff or take the slightest interest in the strange footsteps in the snow until the old ram saw my dreaded stern portion and I wondered if it was the rough patch in my old flannel trousers which had upset the old boy's sense of the artistic. Anyway he was upset, spun round and away they went as only these animals can go.

Wild Goat—I have never in the Taurus Range, Asia Minor, been nearer to wild goat than 600 yards and whatever other senses they may have these must be useless to them compared with their wonderful sight.

Now what we learn from all this is :—

(1) That the scent of man is unknown to the majority of wild animals and only known to leopards or other flesh eating animals by years of contact with mankind, in other words by evolution or bitter hard experience passed down by generation to generation.

(2) Wild animals depend firstly on sight for offensive and defensive action.

(3) Animals living in thick bush have the sense of hearing developed far more than the other organs ; evolution again.

(4) Individual cases of any one animal confuse the judgment with reference to the whole. Shikaries by keeping totally out of sight, or perfectly still when sighted, suitably clad and having suitable foot wear and being careful of dry twigs, etc., need have no fear of being scented.

I have bored you to tears by now, but I do hope that many more articles like the one by Mr. Stuart Baker may appear in your Journal as they do give pleasure and instruction to a mere "Ghooming" nature worshipper like myself who knows no long latin names nor wishes to read the learned quibbles of the men of science but who loves God's creatures great and small and when filled with a good dinner of buck is far more contented than if he had pushed a long new name on to some poor lowly bug.

HUGH COPLEY.

NAGPUR,
24th May 1921.

No. II.—PANTHERS AND ARTIFICIAL LIGHT.

I have read accounts in your Journal of panthers returning to kills beside which a lamp had been placed, but do not remember having seen any account in which a panther had actually killed an animal tied up beside a light. I located a panther in a small hill near here and tied up a goat, but as the panther failed to turn up before dark and as the moon rises late, also having no electric light, I decided to have another try on the following afternoon, and tie the goat up nearer the entrance of its cave. To do this however I had to dig a pit, as there was no cover anywhere that I could sit behind, and bushed it in. I decided to sit up till the moon rose but as there would be about 3 hours of darkness, I was afraid the panther would have time to kill the goat and eat it before I got a chance of even seeing it, so I left word that a lantern should be brought and placed about 15 yards from the goat as soon as it was dark, and should be removed again as soon as the moon rose.

At about 7-15 P.M., the lantern was accordingly placed near the goat. At 8-15, the goat which was lying down, got up and became very uneasy and soon after the panther rushed in and seized it, lying, facing the lantern, holding the goat by the throat. This is a panther that seems to have practically made this hill its home, and lives on anything it can pick up in the surrounding villages, and so has probably got pretty well accustomed to lights. I am wondering if a panther that lives more in the jungles would be as bold; I know of men who have a lantern hung up near their horse when camping in places where there are panthers in order to protect their horse. It does not look as though this is of much use, at any rate so far as the domesticated variety is concerned ! The panther was a female measuring 6 feet.

C. B. BEADNELL.

VELLORE, NORTH ARCOT DISTRICT,
25th June 1921.

No. III.—THE FOOD OF THE SMALL INDIAN CIVET (*VIVERRICULA MALACCENSIS*) IN CAPTIVITY.

On the 24th March 1920, a fully adult civet of this species was caught by my coolies while cutting wheat and I have kept it ever since. Blanford quoting Jerdon says : "Jerdon had several which caught rats, squirrels and birds."

The late Mr. Sanyal states that in the Calcutta Zoological gardens they are " fed on a mixed diet consisting of meat, boiled or raw eggs. plantains, and other fruits and bread ; in fact it, like a large civet, eats anything."

I have not tried mine with either rats, squirrels, or fruit and bread but did with cooked and raw meat.

It readily eats table scraps when they consist of ordinary fowl, pigeon or duck, no matter how they have been cooked, not even objecting to any ; but absolutely refuses to touch *game* whether raw or cooked. I have tried it with quail, teal, snipe, sandpipers and godwit, sometimes cooked sometimes raw, but they weren't touched.

They are said to be easily tamed but though I have had mine over a year now it is just as wild as when I got it. It is a most uninteresting animal, remaining coiled up in a box all day and only coming out at night and darting back to its box if anyone approaches it.

CHAS. M. INGLIS,
M.B.O.U., F.Z.S., F.E.S.

BAGHOWNIE FTY., DARBHANGA, DT. BIHAR,
26th May 1921.

No. IV.—A GOOD FEMALE CHINKARA HEAD (*G. BENNETTI*).

Regarding measurements of the Indian Female Gazelle, it will be interesting to note also that His Highness the Maharaja Sahib Bahadur of Dhar has recently in one of his tours in the Districts killed a very fine head of a female, the photo of which I send as it may be of interest to members.

The measurements of this Female Gazelle are as follows :—

Length 8″, circumference $1\frac{3}{4}$″, and tip to tip $2\frac{1}{2}$″.

G. B. POWAR.

DHAR, *1st July* 1921.

[Unfortunately the photo will not reproduce well. We are unable therefore to publish it but have placed it in the Society's Album.—EDS.]

No. V.—WILD DOGS IN BURMA.*

This is rather a hardy annual, but there has recently been much correspondence in local papers regarding wild dogs and " wolves " said to have been seen by various exalted officials. The following notes may therefore be of interest.

I believe your recent mammal survey only discovered the *large* wild dog in Burma, an animal said to hunt in small packs of six or seven.

I recently sent you the skin of a wild dog shot by a reliable old Burmese hunter, while I was in camp at his village. He killed three and told me next morning that there were twenty-thirty feeding on a dead buffalo (died of rinderpest). Is not this an unusual number ?

Another hunter, whom I have known for years, told me that in the neighbouring Sadwingyi Reserve, he had seen about eighty feeding on a full grown bull Tsaing they had just killed (Several Tsaing have been killed by them recently and last year they killed two village cows close to a village). If we divide by two to allow for " the little one that would not keep still for him to count it, " this would still give a pack of thirty or forty.

I thought that only the red dog of the Deccan hunted in such large numbers and that the Big Burmese Dog was never more than six—ten to a pack.

I have myself never seen more than six or seven together, but in this same Sadwingyi Reserve I have found fresh droppings (all along a road) of a pack that must have numbered far more.

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* See next page.

The local legend is to the effect that wild dog live in a large pack numbering anything up to a hundred and ruled over by a Black King-Dog, this troupe however is rarely met with and what is usually seen is only a small band of outlying scouts.

I have myself only met wild dog five times.

(1) In Shwebo District some Burmans brought one just dead which they had killed with dahs while it was swimming the Irrawaddy (half a mile); it was alone.

(2) In Tharrawaddy District some four or five (mute) were running a Gyi in circles. Twice the Gyi galloped through my camp and the dogs were apparently in relays ringing it in. As I could not see a dog I finished the hunt by bagging the Gyi.

(3) In Shwebo District I saw one dog trotting up a stream and a good ten minutes later the pack (six in open order) came through the jungle on both sides. I killed two (similar to the skin just sent you).

(4) In Shwebo District I saw a Thamin covered with sweat and mud and on killing it found one eye freshly torn out and the other badly gashed. It was very " done " and stiffened at once on being shot. On this occasion the dogs were scared by the shooting as we heard them turn away, but did not see them.

(5) One night in Tharrawaddy in 1910 (cold weather) when camped in the Pegu Yomas, I heard dogs in full cry (rather like a poor voiced pack of hounds). We were some 20 miles from any village, so it wasn't pie dog and as the noise came from the valley *below* me it was *not geese.* The Burmese Girdling Coolies all said " wild dog " and added that one often heard them. This rather upsets the theory that they run mute, but it is the only time I have heard them " Scorning to cry " like Puffington's hounds.

On every occasion the dogs have been of apparently the species of which I sent you a skin, and were in small packs. Is it possible, however, that these dogs (apart from the Black King theory) do at times hunt in much larger packs, or could these alleged packs of eighty seen by Burmans be the smaller variety ?

As to the reliability of the two Burmans, they were both skilled shikaris and not the well known type that wants one after hours of tramping to shoot, a sitting dove with a ·470 H. V. rifle.

C. E. MILNER.

SHWEBO,
10*th June* 1921.

No. VI.—DISTRIBUTION OF SEROW IN BURMA.*

I have recently shot up here, in the Maigthon Hills of Mu Forest Division, a Red Serow which does not seem to fit in with any of the species classified on page 296, Volume XXII, No. 2, of the Journal. The skin and mask are now with Messrs. Theobald of Mysore, should you consider it worth while examining them.

Perhaps a brief account of my distinctly limited experience of Serow in Burma will best emphasize the points I want to raise, namely :—

(*i*) Do the various sub-species of Serow overlap ?
(*ii*) Are the sexes differently coloured ?
(*iii*) Do the different sub-species interbreed ?

I only know of three separate hills in this Division where Serow occur. Each being some 30—40 miles away from the other.

On the first two hills I have never seen more than the animals' tracks, but in each case the Burmans assure me the animal is black with reddish legs below the knee, *i.e., Capricornis sumatrensis swettenhami,* I imagine.

On the third hill I had two beats last January. In the first beat a mother and kid were put out, but I did not see them. Burmese evidence as to their colour is

* The Editors' comments on Mr. Milner's interesting notes will appear in No. 3 having unfortunately been crowded out of this number.

not conclusive (it was variously described as black or like a Saing Nyo, *i.e.* the very dark colour of some old bull Tsaing).

In the second beat I saw the head and shoulders of an undoubtedly black Serow, he (?) watched me for some time, but I could not get a shot ; there is however no doubt that he was black ; I could not see his legs.

A month later I had another beat *on the same hill* and killed a female Serow in dense jungle (hence the sex error) and this animal (now with Messrs. Theobald) was red, but not so red as *in* the plate of *C. s. rubidus* ; more a dark red brown with a few black hairs and a black mane.

Now these Maingthon Hills are continuous with the Chindwin Hills and should therefore, I believe, produce Red Serow ; however on the same hill we have one black one (♂ ?) and one red female. Is it therefore possible that females are red and males black ? (Lydekher "Game animals of India" throws no light on this) or do the species overlap or interbreed ?

The only other Serow head I have seen shot in the District (date, place and sex unknown) was red, but on the other hand the Burmans state that the Serow on the remaining two hills are black.

Again just across the Irrawaddy in the Ruby Mines Hills you get the Black Serow, with a few white hairs on head and back, with red legs. I have seen the head from Bernardmyo belonging to H. L. P. Walsh, I.F.S. (*i.e., C. s. swettenhami* or is it *milne edwardsi*).

Some years ago (1910) when in Tharrawaddy Division, Lower Burma, I shot one ♂ and saw other Serow on the Pegu Yomas and these were all black with red legs. The one I killed had no white hairs anywhere nor had it any white on lips or muzzle.

According to books, however, this would appear to be a *C. s. rubidus* area whereas no one had ever seen a Red Serow there.

Your recent Mammal Survey (I have not kept the journals) has probably given you better statistics on which to base the range of each sub-species and I should be interested to hear exactly what sub-species may be met with in Burma and what their ranges are.

C. E. MILNER.

SHWEBO,

10*th June* 1921.

No. VII.—SOME NOTES ON THE HORNS OF THE THAMIN (*CERVUS ELDI.*)

(*With a plate.*)

In 1918 Mr. Oldfield Thomas published in the Society's Journal (Vol. XXV, page 363) an article entitled " The Nomenclature of the Geographical Races of the Panolia Deer ." In his article Mr. Thomas gives the specific features which differentiate the various races of this deer and also describes a new subspecies, *R. thamin brucei,* which he names after the late Mr. Bruce who shot the specimens on the Thimbaung-gwin Plain.

Mr. Thomas has raised the Manipur race to a distinct species on account of its naked pasterns. Is not this feature due to the marshy ground which these deer inhabit in Manipur, and into which their feet continually sink, so wearing away the hair ? I have been unable to discover any proof that the young of the deer in that area are born with naked pasterns, and until such proof is obtained surely this peculiarity should be considered as being characteristic of a geographical race rather than of a separate species. Perhaps Mr. Thomas can give us such proof or evidence of other special characteristics which in themselves justify the addition of another species to confuse further the mind of the sportsman-naturalist.

Side view of Stag No. 7. Compare with No. 2.

Showing horns forming 3 parts of a circle.
(Stag No. 2.)

Stag No.:— 5 4 3 2
Showing greater divergence in the horns of the older animal.

An old Stag with a very wide head.
Tops palmated (No. 5.)

A fine Stag. (Stag No. 7 from the front.)

THAMIN (*CERVUS ELDI*).

The individual variation of Thamin horns is very extensive, even in beasts of the same age shot on the same ground.

In May 1914 I shot six stags of this species in the Taungwindgyi sub-division of the Magwe district. This ground is almost the centre of the Thamin's habitat, and, as such, the stags should have shown the typical horn features as described by Mr. Thomas in the above article: namely "the horns are comparatively rough and basal snags are always present, commonly 3 to 6 inches long," also "with horns not palmated."

The horns of the six stags I shot were as follows:—

1. Adult but not yet in his prime. Length 31½ inches. One small basal snag on each horn. Beam rough.

2. Probably a year older than No. 1. Length 33 inches. Beam rough and dark. Basal snag one inch long on each horn.

3. A very big stag in his prime. Length 37¾ inches. Beam smooth and dark. A basal button on each horn.

4. A very heavy head. Length 36½ inches. Beam smooth and very light coloured. A basal button on each horn.

5. An old stag with a very wide head. Length 34¾ inches. Horns very rough and dark, palmated at ends. Small basal snag about ½ inch long on each horn.

6. A stag just reaching his prime. Length 34½ inches. Beam smooth and medium colour. One small basal snag on each horn.

In May last year, in the corresponding week, I returned to the ground and shot two more stags.

7. A very fine stag. Moderately smooth light-coloured beam. Length 36½ inches. A small basal snag on right horn, a button on left horn.

8. A very old stag with horns "going back". I sent this head to Mr. Oldfield Thomas hoping that he would find it of interest and worth comment. I have heard nothing from him however, and having mislaid my own notes I can give no details.

For the benefit of sportsmen who may be interested, I may mention that the "all-round" measurement (*i.e.*, tip of brow tine to tip of beam along the curve) of Nos. 3, 4, and 7 respectively were 55¾, 50¾, and 54¾ inches.

It will be seen that the individual variation is considerable, that no stag has a basal snag of more than 1¼ inches long, and that one is palmated.

Mr. Thomas, in describing *R. thamin brucei*, lays stress on the angle of the brow tine to the beam. In my experience a stag's horns do not have the brow tine and the beam in the same line as a rule until the stag is fully adult, and as he grows old the beam develops a decided kink forward half-way up; so that the horns, when viewed from the side, instead of forming three parts of a circle as in stag No. 2 (photo), show this forward kink, which in an old stag almost assumes a right angle.

Another feature on which Mr. Thomas lays stress in his description of *R. Thamin Brucei*, is the smaller divergence of the beam in the new sub-species. This also I have found to increase with the age of the stag. A young stag has the horns only slightly divergent, bent up from the pedicle, and forming three parts of a circle when viewed from the side. Compare photo of No. 2 with that of No. 1. Also compare the two outside heads in the photo of stags Nos. 5, 4, 3 and 2. The divergence in the older animal is very much the greater. I have examined many thamin stags at close range and through glasses, and found this to be a certain distinguishing feature between shootable and immature heads. An immature beast viewed from the side often appears at first to have a good head. Then the continuous curve without the forward kink is noticed, and the horns seen from the front stand high up from the head but with no spread; quite unlike the front view of stag No. 7.

Is it not possible that the two heads from which Mr. Thomas has described *R. thamin brucei* are adult but not very old specimens of the type species? This would explain the small development of the supra-orbital ridge. Also the locality whence the two specimens were obtained is not "a considerable distance" from other thamin. There are plenty of thamin in the Lower Chindwin, Sagaing and Shwebo, within 50 miles of the Thimbaung-gwin Plains, and thence Southwards, wherever there is suitable ground, right away to Pegu.

I think Mr. Thomas should give us a little more evidence before adding another to the numerous sub-species which already exist to the confusion of the field naturalist.

2. *Siamese Thamin.*

In the course of a journey in Siam last year (1920), I passed down the Meping River from Raheng to Paknampo by boat and thence to Bangkok by rail; returning by the same route as far as Hkambengpet, where I left the river and struck across country to recross the Burma border at one of the sources of the Thaungyin River.

There are still a few thamin about 10 miles E. of Raheng, and further down the Meping they seem to have been plentiful on the left bank below Hkambengpet up to two or three years ago, but have now been much reduced by natives hunting for the Chinese horn trade, and are only to be found 25 miles or more from the river. According to native report they are still plentiful 30 miles East of Klong Klung.

I examined three heads at Raheng, three at Hkambengpet, and two recently killed near Klong Klung. The first six had no traces of palmation. Of the last two, one, which I purchased and which is still in my possession, is heavily palmated: the other showed distinct flattening of the beam. The palmated head is the larger of the two and measures 31½ inches along the beam. At Paknampo I saw three heads; one in the Bombay Burma Coy's bungalow was well palmated, while the other two were in shops in the bazaar and had no signs of palmation. In Bangkok, of twenty heads I saw only eight were palmated, while five others showed slight flattening in the terminal third of the beam. Basal snags were wanting in some cases, and in no case numerous or large.

On my return to India I wrote to Mr. P. R. Kemp, head of the Survey Department of Siam and a keen shikari and naturalist, to ask him for observations on heads in Bangkok with particular regard to the sub-terminal tine and the question of palmation. I quote from his reply. "... I have been struck by the lack of a sub-terminal tine of any length in the specimens that come from Eastern Siam, Korat and Ubon provinces. In many there is no tine at all to speak of and the end of the horn carries a series of snags for some 7 or 8 inches, with perhaps one snag of considerablygreater length than the others. There is a certain amount of flattening in addition though it hardly amounts to what I would call palmation. I saw no basal snags at the junction of beam and brow tine. Some heads from Paknampo, probably brought down from Raheng district—carried a more distinct subterminal tine in addition to snags and appeared—as heads—to average a larger size than the Eastern heads. .... Most thamin heads in Bangkok come from the Eastern provinces. I have not however examined sufficient number to quote proportions, etc., but those I have looked at certainly have nothing like the sub-terminal tine development that illustrations show in the pukka '*Cervus eldi*' of Burma."

Mr. Kemp's observations agree exactly with my own. I think it more than probable that the thamin heads bought in Bangkok are more often than not selected to be sent home on account of their being palmated, and that palmation should not be laid down as a horn characteristic of the thamin of Siam.

The best pair of horns I could hear of from Siam measured 34½ inches, and there seems no doubt that they do not run nearly as big as the Burma heads. The average of good heads is not more than 31 inches in Siam.

From the above data, and judging from the large number of heads I have examined in Rangoon, the following inferences may be drawn. That in the Northern districts of its habitat the horns of *R. thamin* tend to few and small basal snags, the number and size of the snags tending to increase the further South they live in Burma, and to decrease in S. E. Siam. That roughness (or the reverse) of the beam is an individual peculiarity with, perhaps, a tendency in Siam to more pronounced "pearling". That the sub-terminal tine is always present in Burma specimens but is inclined to disappear the further to the South-East we go in Siam. (My own specimen from the Meping valley has large sub-terminal tines). That palmation is rare in Burma but that there is a strong tendency to palmation in Siamese specimens, though I should say that under 40 per cent. of Siamese heads are palmated.

From such data it seems undesirable to differentiate geographical races and sub-species which must evidently grade into one another, until bodily characteristics come to light which give us definite differences from definite districts.

I was told that stags in the Meping valley are spotted in the hot weather, but could not obtain a skin or other confirmation.

I hear that Mr. Thomas is now working out the races of the Thamin, and all sportsmen and naturalists will be greatly interested in the results.

C. H. STOCKLEY, Major.

Chaklala, Punjab,
July 1921.

No. VIII.—A BABY HOG DEER IN CAPTIVITY.

"Going mad."

One of the daintiest little pets, I have ever had, and I have had a great many of all sorts, is a baby para (Hog deer). "Wee-Wun" was picked up by a mahout when we were beating with a line of elephants the grass lands by the Kasi River in the Mowng in March. The place was swarming with para, every fifty yards or so there would be a rustle in the grass and up would jump a para, jinking in and out of the grass with head low and ears laid flat back. Even when not scared

they creep about very quietly, hardly showing themselves at all. One little one we put up was in such a hurry that he didn't look where he was going—put his foot in a tuft and went head over heels, much to the amusement of the mahouts. The para stag's horns all seemed to be in different stages. Some were in velvet, some fully grown and one that I shot appeared to have dropped one horn. Para get their name of Hog-deer from their habit of creeping about with their heads down I suppose, though anything more unlike a pig I have seldom seen.

Two babies were brought to me when I got back to camp, a buck and a doe. The doe was smaller, had rather a longer face and was not quite such a bright brown as the buck. Both were spotted something like a cheetal or Spotted Deer but without the white stripe along the side and with brown legs instead of white. Neither could have been much more than a week old and both were very tottery on their legs. It was rather a puzzle to know how to feed them, but, remembering how I had once brought up a little Markhor successfully, I tried the same dodge. I took a small sponge, wrapped it in a handkerchief, then dipped it in warm milk and water. They refused at first to have anything to do with it, but with patience and perseverance I succeeded in making them take a little. The doe, which was much the quietest, picked up the idea quite quickly but the other was most difficult to manage. I fed them once or twice during the next few nights, and tried to quiet them but they were very restless. Once they must have smelt a panther because both started up in evident panic and the peacocks all started giving the alarm and I thought I heard one talking far away.

They had a terrible journey up here (Khatmandu) poor little things, 8 hours on an elephant, 36 hours in a train, a day in a Ford over the most appalling bumps, and a day on coolie. That, and the change of temperature, was too much for the little doe—she died during the first night. " Wee-Wun " missed her sadly and bleated continuously at first but got over it in a day or two. The bleat was not like that of a sheep or goat—more a drawn out squeak—often he would squeak and seemed to want to make it longer, leaving his mouth open but nothing happened. The full grown deer has a call something like the cheetal.

By this time he drank his goat's milk out of a saucer and would take it without any bother. Diluted cow's milk didn't suit him at all though he quite liked it. He was loose in the garden all day and would totter about on his little wobbly legs right on the very tips of his toes. Even now he never seems to stand down on his hind feet, he only uses the very tips. In a week or so he began taking interest in leaves and would nibble at a leaf in an absent minded sort of way, then stop and stare far away. Leaves seemed to attract him much more than grass, which seems curious, as he came from a grass country and I believe para are not browsers as a rule. He must have been about a month old before he discovered that clover was most excellent. I had tried to induce him to eat it for same time by picking it in front of him. He had been in the house with us most of the day because it had been raining, then when we went out he suddenly rushed at a tuft of clover and started eating as hard as he could. From that day he made rapid progress in the grass eating line and I reduced his milk.

He is very tame and up till a week or so ago would follow me wherever I went, and always lying down in the heat of the day, or when he got tired, in the rose beds close to the house. From the very first he showed an inclination to get amongst cover of some sort and was much happier creeping about, head low and ears laid flat, in and out of the bushes, starting at imaginary alarms then quietly going on again, than out in the open on a lawn. Now however he is much more independent, preferring to go exploring all by himself and choosing new lying down places. He is a most secret little fellow and hates to be seen lying down ; if by any chance, when I'm hunting for him I come across him in his nest he will never go to that spot again, though if I call him and he leaves his nest without my actually seeing him in it, he will go there again and again till it is discovered.

"SURPRISED!"

"CREEPING ALONG HEAD DOWN, EARS BACK."

YOUNG HOG DEER (*CERVUS PORCINUS*).

We thought he might be rather lonely, so we asked if some other young deer couldn't be got and they brought a cheetal doe—six months old—which wasn't quite what we wanted. However we left her and now the two are great friends though Wee-Wun at first was terribly scared, bolting right away when he first caught sight of her. I sometimes take them a walk about the grounds in the evening, both following me, then when they get to a good bank they go quite mad—dashing up and down, bucking and skipping. "Wee-Wun" is very quick and nimble now on his legs bringing off the most astonishing jinks combined with a buck and a kick. At first he used to fall down in his efforts, but he is quite able to take care of himself now.

Up till quite lately I always shut him up at night because of the violent storms we get. He always followed quite willingly and once or twice put himself to bed, but lately he has been more and more unwilling to come to bed till the other evening he flatly refused to come. I succeeded in making him come about 20 yards; then realising it was bed time he kicked up his heels, shook his head and bucked away into the bushes. So I let him have his way—possibly he may realise that a brick roof is better in a storm than the thickest bush. That shake of his head is a most curious little trick. He began it when he first got at all steady on his legs and is always doing it when he feels impish and full of beans. His tail he uses as a sort of signal though I've not discovered yet quite what it all means. If he is scared and wants to get away quietly he keeps it low, makes himself invisible—but if he is being chased it goes up. When he goes mad it goes up and when I'm calling him for his milk he answers with little squeaks and his tail goes up as he hurries towards me. It seems to depend on the pace. Wee-Wun gets in a fearful state of excitement over his cup of milk, stiffening all over and nearly upsetting it all in his violent efforts to drink it more quickly. He buries his nose right in, up to his eyes almost and I had to teach him to take a breath in the middle otherwise the consequences were disastrous. A curious thing about him is that when he has been asleep his tear ducts are very wide open, so that the pink at the bottom can be seen though, at other times they are close shut. What is the reason of this I wonder ?

Wee-Wun has a much shorter head than the cheetal—much deeper in the jaw, really prettier. The spots on his sides have nearly disappeared now, only those on each side of a dark stripe down his back remaining clear. One can feel the place where his horns will come, rather softer spots than the rest of his skull, he loves them to be rubbed. Wee-Wun imagines he is quite a big buck though really he is only 17½ inches high.

T. A. K.

No. IX.—THE INDIAN PANGOLIN. (*MANIS PENTADACTYLA*), L.

In the Fauna of British India (Mammalia), page 598, is given the dimensions of three male pangolins as follows :—

No.	Head and body.	Tail.	Total length.
1	24.5″	18″	42.5″
2	26″	18″	44″
3	23.5″	22.5″	46″

The last one is a Ceylon specimen. A male specimen was brought to me on the 18th April which measured—

head and body	31	inches.
tail	20·5	,,
Total length	51·5	inches.

This is, as far as known to me, the largest specimen of the species yet recorded. It was killed at Paunda, near village Kandholi, Dehra Dun (2,700 feet) U. P.

N. C. CHATTERJEE,
B. Sc., F. E. S.

DEHRA DUN, 21*st April* 1921.

No. X.—THE HABITS OF THE GREY MONGOOSE.

I presume that the idea that the mongoose is immune to the venom of snakes or that it instinctively recognises and eats a vegetable antidote (though how the *eating* of anything could cure so rapidly acting a blood poison was never explained) is now quite exploded. It would seem probable that this animal is immune to the poison of scorpions and centipedes however. At least so it appears to three of us who have been watching the operations of a tame mongoose of late. As she (the object of our observations is feminine) has not yet been offered every possible article of the first of the two great classes Heine sub-divided nature into: "things one can eat and things one cannot eat", we are not prepared to say definitely what is her favourite food. Though she is not more than 3 months old she has killed and eaten several frogs (she invariably seizes them by the head, so that they are unable to protest vocally), at least one rat (and devoured another freshly killed) and several scorpions and centipedes, besides insects galore. Her predilection seems to be for frogs, rats and scorpions, and also nice fat, luscious grasshoppers or locusts, and this she demonstrates by a continuous growling while eating a morsel she specially appreciates, even when there is no one near to interfere. When attacking either a scorpion or centipede she takes no precaution to avoid being stung. We were able to watch one affair with a scorpion fairly closely. The scorpion was brought in undamaged and placed on the floor. The mongoose immediately seized it about midbody so that nearly the whole of the tail was free and projecting from one side of her mouth. She then carried it about without causing it any serious injury as was seen when she dropped it and started playing with it as a cat would with a mouse, while the unfortunate scorpion attempted to seek safety. While the scorpion was carried in the mongoose's mouth as described we noticed that its sting was pressed against the beast's cheek. Whether the sting actually pierced the skin we could not tell, of course, but it had every appearance of having done so and there seems no valid reason why it should not. The mongoose, however, showed no sign of discomfort either then or afterwards.

When she had finally eaten her prey, including the poison bulb and the sting which she seems to consider a *bonne bouche*, I carefully examined the cheek but could perceive neither puncture, swelling nor soreness.

The mongoose is very friendly and playful with the dogs of the household and with all humans. The cat, however, though she once knew and liked another mongoose, will not let this one approach her and seems afraid. She bolts if the mongoose comes near and the latter erects her hair so as to appear twice her size.

Before meeting this exemplar I was not aware that a mongoose could purr like a cat and for the same reason.

C. E. C. FISCHER.

TRIPLICANE, MADRAS, 24*th July* 1921.

No. XI.—THE EFFECT OF A SCORPION'S STING ON A TERRIER.

At 10 P.M., on the 5th June, my dog, a big, smooth-haired fox terrier was stung by a scorpion. I applied Scrubbs' ammonia to his foot within a few minute of his being stung, but it did not give him any relief. He yelped or howled almost without ceasing for an hour and nearly went mad with the pain.

His eyes were bulging and he kept snapping at us. At one time he gnawed at the legs of his bed and bit through the strings. After an hour he was sick and continued vomiting until his stomach was empty. This was followed by retching every few minutes, and he evidently broke a blood vessel as he brought up some blood. He was much exhausted and lay on his side. He then passed a lot of blood through his rectum while on the ground. From the time he began to vomit, the attacks of severe pain became less frequent. About 1-30 A. M., he seemed much quieter and I had him cleaned and put on a soft bed of grass. At 2 A.M. I gave him two dessert spoonfuls of brandy and water and he went off to sleep in half an hour. At 7 A.M., he was a little weak but otherwise alright. I gave him milk diet on that day which he took sparingly, and he is now quite fit and well.

E. O'BRIEN, LT.-COLONEL.

BHUJ, CUTCH, 9*th June* 1921.

No. XII.—A PANTHER'S INDIFFERENCE.

I had the luck to bag a fine panther yesterday, of a size somewhat remarkable for the Kanara District; a male, length 7′-2″. The circumstances which are very peculiar may be of interest for the records of the Society as they indicate an extraordinary lack of fear of man in the animal concerned. Yesterday afternoon, the 21st May, I left Mungod, on my Motor Cycle for Konankeri, a distance of 10 miles, to *shikar* cheetal at the latter place. Having spent an enjoyable though unsuccessful afternoon there, I started on the return journey to Mungod about 20 minutes before sundown. I had replaced my rifle in its leather case which was again padded by several yards of cloth wound round it, and the whole securely strapped by many passes of the strap, to the Motor Cycle carrier. As I reckoned on getting home before dark, I opened the throttle and the exhaust cut out, and the machine being a powerful Harley Davidson I was travelling at over 30 miles an hour to the accompaniment of a very great deal of noise and dust. About two miles from Konankeri coming round a bend, I saw a large panther sitting on the road side. I immediately cut off the engine and braked, and came to a standstill twenty yards past him: it was lucky that he was not directly in my line of travel. Having dismounted and pulled the machine up on the stand I allowed myself a hasty glance and noticed that the panther was still sitting on his haunches and quite unalarmed though the dust of my sudden passage was yet eddying round him. I immediately began to unpack the rifle with all haste, keeping my back to the panther. It was a full half minute before the rifle could be got ready for action possibly longer: then when I looked again he was gone. I walked back the 20 yards to the spot I passed him, and saw him at once; he was lying at the foot of a tree ten yards inside the jungle, and looked up at me quite unconcernedly without evincing the slightest intention of moving. I believe I could have taken five minutes over my aim had I so desired, but as he was offering his full broadside at ten yards range this was quite unnecessary. I put a bullet through the middle of the target, passing an inch behind the heart, and he dropped dead at the end of a 15 yard run. The rifle I was using used to be the official property of a German infantryman. I had brought it from Ypres as a souvenir in 1917. It is of the 7 mm. mauser pattern. Having dragged the panther to the road, with the commandeered assistance of two cartmen, who were approaching within fifty yards of me when I fired, by the combined effort of the three of us it was hoisted across the Motor Cycle carrier and secured by a ten foot strap, its extremities being tied away from the

ground by means of the cloth previously referred to. The whole incident had occupied less than a ¼ hour, and now there only remained to light the head lamp and proceed home, which was accomplished successfully though cautiously at a modest speed of 7-8 miles an hour.

This incident demonstrates the extraordinary luck of shikar, a fine panther being secured devoid of all cost in the matter of goats, beaters, or 'bundobust.'

H. J. C. MILLETT, I.F.S.

CAMP, *via* DHARWAR,
21*st May* 1921.

No. XIII.—KASHMIR BIRD NOTES.

While not specially on ornithology bent the surrounding birdlife, among other scenic charms, was a source of never failing interest and pleasure to me on a walking tour, accompanied by Larry, an Irish terrier, through some of the northern valleys of Kashmir in the fateful months of June and July 1914.

The following few observations, of many cursory and unrecorded ones on birds met with during the tour, contain nothing new or original, but may be of passing interest, and serve further to amplify notes on Kashmir birds published by me in Vol. XXI of this journal.

THE JUNGLE CROW (*Corvus macrorhynchus*) is mentioned in the Fauna as 'occurring in every portion of the Empire *except the higher parts of the Himalayas*' (the italics are mine). I have seen this species at 12,000 feet and over, and not as an isolated occurrence, but commonly. Possibly the spread of graziers, with their flocks and herds of cattle, sheep and goats, to the higher grazing grounds on the borders of the melting snows in the Kashmir Himalayas in recent years, may have attracted these crows to higher regions for the sake of the pickings to be got.

THE YELLOW-BILLED CHOUGH (*Pyrrhocorax alpinus*) is a much less noisy bird than the red-billed variety.

HODGSON'S TREECREEPER (*Certhia hodgsoni*) was a new acquaintance which I found nesting at about 11,300 feet. The nest was in, and behind, a large crevice in the bark of a silver fir at some 12 feet from the ground. The visible portion consisted of comparatively large bits of twig and chips of bark which must have taxed the strength of the birds to carry and fix in position.

Both parents were indefatigable in their attentions to the young, arriving at short intervals at the nest with bills festooned with the broken remains of large insects. Enormous quantities of food were thus apparently consumed by the voracious nestlings during the day. I did not climb to the nest, but possibly a young cuckoo was stumulating the parental care and activity. At this elevation it would have been *canorus* or *poliocephalus*, both of which occurred.

The length of bill in this species is very noticeable compared with that of *C. himalayana*.

The SLATEY-BLUE FLYCATCHER (*Cyornis leucomelanurus*) is very like typical *Siphia* in the action of the tail. There is the same vigorous flick upwards though the preliminary motions are more vibratory. The female is so similar to *Alseonax ruficaudus* in coloration that although there is a difference in size, a difference which is not always easy to detect when the bird is in a tree, it is the tail action, and the less active habits of the present species, which will enable one to differentiate between the two species in their natural surroundings. I met with this flycatcher at over 9,000 feet.

THE BLUE-FRONTED REDSTART (*Ruticilla frontalis.*) At an elevation of about 11,300 feet I saw an abnormally placed nest, containing young of this species. It was 20 feet up in a shallow hole in a birch tree, in a small grove of these trees.

THE ROBIN ACCENTOR (*Tharrhaleus rubeculoides.*) On the watershed above Tar Sar lake, Liddar valley, at an elevation of a little over 13,000 feet, an accentor

which, crossed my path I noted as *Tharrhaleus rubeculoides*. This bird's mode of progression on the ground was by long sparrow-like hops.

The Himalayan Rubythroat (*Calliope pectoralis*) has a song which is loud, continuous and shrill, but compasses some very pleasing notes. A fair imitation of it could be produced by rapidly rotating the lid against the box of an oldfashioned circular wooden pillbox. This bird has been usually associated in my mind with glacier moraines and running water. But a nest found, containing young, was on a small spur on an open hillside, at about 12,000 feet, far from water, and within a few feet of a track along which Kashmiris, gujars, ponies and cattle passed daily. It was built in the ground under a tiny juniper bush, and, failing to see the parents, I should certainly have attributed the ownership to a pipit, lark, or meadow bunting.

The nest was a deep cup or rather cylinder, composed almost entirely of fine grasses with a little moss to finish it off round the upper edge. The tail of the female when sitting must almost have touched her head, the nest was so deep.

The young appeared to be fed principally on a species of leather jacket or daddy longlegs which was plentiful in the vicinity. Both parents were equally assiduous in bringing food to the nest.

This pair paid the penalty, usual in nature, of nesting in abnormal, and exposed situations, for the family came to grief a few days later, the nest being rifled, probably by some marauding Jungle crow.

The Blueheaded Robin (*Adelura cæruleicephala*). A robin hopped close to my tent one day while I was encamped near Surphrar Sind valley, and allowed me to catch it. It was a young female Blueheaded Robin (*Adelura cæruleicephala.*) I was surprised to find this species at such a low elevation, not more than 7,000 feet, but came to the conclusion that it had dropped down the steep hillsides from immediately above.

The Central Asian Blackbird (*Merula maxima*) was not uncommon at about 12,000 feet in two or three of the higher valleys I camped in but this species appears to be local in its distribution in Kashmir. It differs in many respects from our common blackbird, *Merula merula*. In coloration the male *maxima* never seems to assume the glossy blackness of the male *merula*, and, in my experience, the colour of the former is always a dull brownish black. Moreover the females of the two species are very different in colour, *M. maxima* being almost a grey bird as opposed to the distinctly brown female of *M. merula*. Again the songs of the two species bear little resemblance to one another, that of the present species having little of the fine flutelike tone one associates with the song of the common blackbird. Although containing some pleasing notes, the song of *M. maxima* is largely composed of wheezy drongo-like utterances with an occasional loud whistle not unlike that used by Kashmiri shepherds when herding their flocks. The alarm note also is much less loud, harsh and squeaky than that of *M. merula*.

When hopping, however, along the edge of the melting snow, digging for worms *M. maxima* does remind one of the "blackbird on the lawn."

At Sonamuss above Surphrar, at an elevation of 11,500 feet, I came across a small flock of Rose-Finches composed of two species. These were *Propasser thura*, The White-Browed Rose-Finch, and *Procarduelis nepalensis*, The Dark Rose-Finch. The male of the latter species is a beautiful bird when in full breeding plumage.

A pair of Rose-Finches was seen at as low an elevation as 9,500 feet in July. I could not properly identify them but am nearly sure they were *P. thura*.

The Red-Browed Finch (*Callacanthis burtoni*). The song of this bird is monotonous, and all more or less on one note, but the 'timbre' redeems it from being unmusical. The song is quite distinct from the call notes described by me in Vol. XXI.

Hodgson's Yellow-Headed Wagtails (*Motacilla citreoloides*). A few of these were breeding around lake Gangabal Haramauk, and in the vicinity.

Hodgson's Pipit (*Anthus rosaceus*) was also breeding in considerable numbers about lake Gangabal, but among parties of this species was, what appeared to me to be, a different pipit, very like the Tree-Pipit *Anthus trivialis* which occurred in the locality. This doubtful pipit was, I feel nearly certain, The Meadow Pipit (*A. pratensis*) but I failed to collect an example to make sure.

Hodgson's Pipit sings mostly on the wing. The bird first soars to a considerable height; and then descends with outstretched wings in a sort of ' vol plane ' while simultaneously it commences the song with a syllable like ' chup,' rapidly repeated several times, followed by a more slowly repeated 'sweet' as it approaches the ground.

Stumbling on a nest of this species at Kolahoi one day I nearly trod on the sitting female which rolled down the hillside in a wonderful manner with legs, wings and neck apparently broken to smithereens.

The Common Lark (*Alauda arvensis*) is somewhat crepuscular in habits in Kashmir. One delightful bird perched, with its mate, on a stone, about 30 yards from my dinner table, one evening and serenaded me till it was almost quite dark.

The Small Cuckoo (*Cuculus poliocephalus*). I solved the (to me) enigma of the notes, which so puzzled me at Sonamarg in 1912, *vide* p. 1313, vol. XXI. 4, and which puzzled me again this year (1914) till at last I caught a glimpse of a flying bird, and eventually secured an example after much patient shikar and watching. The author of the sounds was none other than the Small Cuckoo (*Cuculus poliocephalus*). This cuckoo is fairly ubiquitous in Kashmir, occurring at all elevations, and, in the same month, from the valley itself 5,100 to 11,000 feet and over,though it is,perhaps, not so common as *C. canorus*. In some favoured spots these little cuckoos collect, and here they make both day, and a good part of the night, ' hideous ' with their very extraordinary notes, although perhaps not more than half a dozen individuals may be present. The number of birds in a locality must always be hard to compute from the notes. At Liddarwat, 9,500 feet, I was encamped in a clearing in silver fir forest, and for one whole day one solitary individual of this species kept up an almost incessant cackle, not being silent for more than half an hour from 8 A.M. till dusk. It constantly changed its perch from tree to tree in the forest around my camp, and sometimes called on the wing, and to anyone not versed in the ways of this freak among birds it would certainly have appeared that there were at least a dozen or more birds calling. This particular bird so exhausted its syringeal muscles by its performance this day that it remained silent throughout the night, but recommenced at 7-30 A.M. next morning, and called till about 9 A.M. ; then finding, I suppose, that there were no responsive females in the neighbourhood it shifted to another part of the valley. But it returned in the evening, and called at intervals during the night. It remained in the vicinity calling daily, and, intermittently, at night till I left on the 23rd July. It was the only bird of this species, to my knowledge that I heard or saw in this particular spot during my stay of 12 days.

The following words may serve to convey to the ear the cadence and to some extent, the sound of the notes, *viz.*, " That's your choky pepper." When the bird is vigorous at the beginning of the season a syllable is often added to this, and conversely,when the vigour is waning at the end of the season, a syllable may be omitted. The ' timbre ' of the note allowing for the much greater loudness is not unlike that of the White-cheeked Bulbul (*Molpastes leucogenys*). On an open hillside it can be heard a quarter of a mile away or more. The note of the female is not unlike that of the female *canorus*, but is more slowly repeated, and perhaps more nearly resembles that of the female *C. saturatus*, but is less loud. The immense energy put into the call-notes by the male, and the power of the

muscles of the syrinx is, apart from the volume of sound, evidenced in the working of the lower mandible, the marked distension of the throat, and the jerking of the whole body and tail.

Unlike birds of the passerine families and indeed others of its genus, THE SMALL CUCKOO does not usually call at dawn, but generally commences some two hours after sunrise. It becomes active in this respect, from about 8 or 9 A.M. till noon, then again in the evening, again at dusk, again, moderately so, after dark, and even at midnight, and again commonly at about 3 or 4 A. M.

This is not an easy bird to spot or collect. One hears its notes all round but they are ventriloquial in character, and when in a tree and calling, like others of its genus, it keeps very still. Under favourable circumstances however, it may be seen perched on the topmost twig of a tree, uttering its call, or may be found, towards evening, coming to the ground to hunt for caterpillars in the undergrowth.

I do not know what species this cuckoo victimises in Kashmir, but around Surphrar, where it was so common, *Horornis pallidus* occurred in great numbers, and *Alseonax ruficaudus* was also extremely common.

SCULLYS' WOOD OWL (*Syrnium biddulphi*) is, in my experience, by far the commonest owl in Kashmir in summer. It occurs at comparatively high elevations, 11,000 to 12,000 feet or over, and occasionally nests above tree limit. This latter was the case in one valley I camped in. Here there were only a few scattered and stunted birches about, and I came to the conclusion that the owls, which called so frequently at night, were nesting in holes in cliffs. These particular birds certainly belied the generic trivial designation, for there was nothing that could be called a wood in the immediate vicinity. Doubtless an abundance of food supply explained their presence in these haunts, the hillsides being riddled with the holes of mice and voles. Small rodents seem to be the staple food of this owl in summer.

In connection with the food of this species I may remark in passing that a solitary Scullys' Wood Owl took up its winter quarters in the compound of my bungalow in Kohat, and roosted there for 2 months or more, in a toon tree about 10 yards from the bungalow. This bird, I was glad to see, fed mainly on sparrows but occasionally, he or she, (I did not discover the sex) varied the fare with a bulbul (*Molpastes leucogenys*) or a shrew. A feeble attempt at the 'hoot' was sometimes to be heard, as the winter passed, but the 'khawak' note was frequently uttered when on the wing, and occasionally when perched.

H. A. F. MAGRATH.

MALAHIDE, Co. DUBLIN,
September 1920.

No. XIV.—THE AVIFAUNA OF THE NELLIAMPATHY HILLS.

41. *Motacilla melanope.* In the series of these notes, published in Vol. XXVII, No. 4, I stated that this bird left early in March. This I then believed to be correct, but this year, at any rate, these wagtails are still with us, though in greatly reduced numbers, and what I certainly do not remember to have seen before, are now in their summer plumage. The Rose Finch, Blue Headed Rock Thrush, etc., left here in the first half of March.

29. *Stoparola melanops.* Mr. Stuart Baker, *in epistola*, considers that this bird must have wandered so far South as a winter migrant. This is undoubtedly correct as I have seen none of these birds since the end of March, but it was decidedly common during the cold weather.

91. *Neopheron ginginianus.* Observed a solitary bird by some cooly lines on the 20th March.

92. *Pycnonotus gularis.* The only specimen I have seen was on the 24th March, near the top of the Northern slopes.

A. P. KINLOCH.

NELLIAMPATHIES,
8th April 1921.

No. XV—ROOSTING HABITS OF THE COMMON BABBLER (*ARGYA CAUDATA*).

The other evening, early May, at dark dusk, sitting in my garden, I saw three shadows go into a thick (leaf and flowers) branch of a pim tree about 7 feet from the ground. Shortly 4 or 5 more arrived, from a different direction, which I could just make out to be the ordinary " Seven sisters ". I gave them time to settle and then went with a hurricane lantern to look. I found the birds sitting in a row all heads the same way and so tight together that one who drew breath out of time must have waked all the others. It really looked more like a close brown fur " boa " with pale bird faces struck on. They did not mind the light held within about 6 to 10 inches of them, nor did they mind my wife and two other ladies making audible remarks about them. They were in the same place and same position for about a week after I found them.

A. G. FRERE., I.A. MAJOR,

ST. THOMAS' MOUNT,
4th June 1921.

No. XVI—BEHAVIOUR OF THE WHITE-CHEEKED BULBUL (*MOLPASTES LEUCOGENYS*) WHEN ITS YOUNG IS IN DANGER; AND THE (?) PARENTAL INSTINCT OF LOVE FOR THE OFFSPRING DISPLAYED BY THE DARK-GREY BUSH-CHAT (*OREICOLA FERREA.*)

The habit among parent birds with eggs or young of simulating injury when one approaches the eggs or young, as the case may be, seems to be one that is practised by various species that are widely different from each other. The Plovers possess this " injury feigning instinct ", and Mr. Dewar says that it is best developed in the Pratincoles. But there are some other familiar Indian birds which behave in a similar manner. For example, the late Mr. Dodsworth recorded an interesting note on the behaviour of the Short-billed Minivet (*Pericrocotus brevirostris*) when its nest is in danger (*Vide* J.B.N.H.S., Vol. XX, No. 2, pp. 156, 157). Such an instance seems very unusual. Recently I had an experience which provides another example of the fact that some of our commonest Indian birds pretend (?) to be damaged. I do not know why it is, but the habit of feigning injury seems to be one usually associated with birds of the plover type. In this case the birds were White-cheeked Bulbuls (*Molpastes leucogenys*).

On the 10th July I was going for an early morning stroll in the grounds of the Imperial Secretariat at " Gorton Castle " in the hopes of finding nests of *Molpastes leucogenys* and *Trochalopterum lineatum*, but in this I was unsuccessful. While examining a large wild-rose bush, I noticed a bulbul on an adjoining deodar, and on coming under the rose-bush, another bulbul flew out from it. I thought perhaps that there was a nest, especially as the two bulbuls on seeing me set up an alarm which made me feel all the more convinced. Although I searched the bush carefully I found no nest, but eventually I had the good fortune to spy a young bulbul. To try and capture it was now my aim; but it gave me a good chase and finally succeeded in making good its escape by flying on to a low bush

which was situated in a place where I dared not venture with any degree of safety. I followed the bird from bush to bush and from tree to tree, but as soon as I would approach sufficiently close to grab it, it would fly off again. This lasted for about an hour and showed me that the bird had fairly good powers of flight. During my chase after the young bulbul, the behaviour of the parent birds was very noticeable. Of course, they were full of alarms and curses. As a rule they would follow the young bird about, sitting on the same branch with it, but flying off again as soon as I came too close. On several occasions, however, one or the other, and sometimes both parent birds would suddenly fly down to the ground, and there tumble and roll about in a most peculiar manner, or flutter about with one of their wings hanging helplessly as if it had been broken. I do not know whether bulbuls often behave like this, but this is the first occasion on which I have seen them doing so.

While chasing the young bulbul I noticed what may possibly be an example of the parental instinct of love for the offspring. Before I came across the young bulbul, I noticed a pair of Dark-grey Bush-Chats (*Oreicola ferrea*) which seemed to be in a very disturbed state of mind at my presence. A little search revealed a young bush-chat seated quietly in the middle of a small shrub. I had no desire to capture the young bird, so I left it alone and passed on, but the parent birds followed me with great pertinacity, giving vent to alarm cries the whole time. The parent bush-chats followed me till I came across the young bulbul. Up to that time perhaps they were concerned at my discovering their own offspring, but now they joined in the cries raised by the old bulbuls! The bush chats seemed to forget that they had a young one of their own and devoted their attentions to the young bulbul! Although in my hunt after the bulbul, I twice passed the bush where the bush-chat was, its parents thought no more about it and were entirely absorbed in the welfare of the young bulbul! I do not profess to know whether this is reason or instinct, but I am inclined to think it is instinct. Presumably the bush-chats recognised the bulbul as a young bird and instinct impelled them to see to its safety; and presumably also the bush-chats forgot about their own young one on account of the behaviour of the parent bulbuls. If there had been no bulbuls to distract the attention of the bush-chats they would have concerned themselves about their own young one, as indeed they were doing when I first found it. Otherwise, why would the bush-chats trouble about the young of a bird of another species, when they had a young one of their own to look after? And why did the bush-chats not leave me alone when they discovered that I was after a young bulbul and not a young bush-chat? Perhaps the maternal (and paternal, I suppose) instinct was suppressed by intense fear, and the birds were only thinking of raising an alarm and nothing else. This view may perhaps be the right one, as at one time during the chase after the young bulbul, I counted the following birds: the two adult bulbuls, the two adult bush-chats, a male house-sparrow, a green-backed tit, and a pair of laughing-thrushes, all helping to make an awful din, and to shout advice to the young bulbul!

S. BASIL-EDWARDES.*

SIMLA, *25th July* 1921.

No. XVII.—AN ALBINOID *OTOCOMPSA EMERIA*.

Some time back I had experience of two "freaks" among "Bulbuls". One was an albino *Molpastes* and the other a melanistic specimen of the same species. I have been fortunate enough to come across another case of albinism in another species—the *Otocompsa emeria*, the widely known Red-Whiskered Bulbul. The bird was caught wild and brought for sale. Below I give a description of its colouration:—

All those parts, the head and around it which were deep black, have lost this vivid colour. The forehead, lores and the front part of the cheeks are dark

* See footnote page 267.

brown. The crown is also brown with a few whitish feathers in the crest. The narrow black moustachial streak surrounding the ear-coverts and joining the crown is light brown ; the hinder parts of cheeks and the ear-coverts are white as usual. The crimson tuft of feathers springing from the lower eye-lids, is retained in a very small spot just there. In a normal bird this crimson passes over the ear-coverts, but in the present specimen it does not do so. Sides of neck and a broad crescent interrupted in the middle of the breast, which should have been brownish black, have become light brown, the crescent ending in just a faint tinge. The undertail-coverts retain their normal crimson colour, at the edges, however, it is lighter. Upper plumage, the flanks and thighs, as also the lower plumage, are white with a tinge of bluish ; the tail is completely white. Back and wings are white, the latter washed with a faint light-orange.

The colour of the bill, claws and legs has also been affected. The bill and claws are blackish brown, the apex of the bill being whitish, while the legs are pinkish brown. Iris light-brown.

SATYA CHURN LAW.

CALCUTTA, *3rd June* 1921.

No. XVIII.—THE WHITE-SPOTTED FANTAIL FLYCATCHER (*RHIPIDURA PECTORALIS*).

This pretty little active flycatcher is common in the Central Provinces as well as in other parts of Western and Southern India where it replaces its near relative, the White-throated Fantail, the common species of the sub-Himalaya

and Eastern portions of the Empire. It is essentially a bird of shady wooded nalas and ravines but is also found in gardens and shady groves and is especially fond of the big thorny bamboo. In the Central Provinces they breed in March and April and possibly again later. The nest is a neat little inverted cone of fine vegetable fibre felted together with cobwebs and lined with fine grass.

Three or four eggs are laid which are cream with a dense ring of yellowish brown and grey spots towards the big end.

The nest is often attached to drooping branches of shrubs or trees overhanging a stream. That in the photo was in such a position, the plant to which it is attached being *Heptapleurum venulosum*, an epiphytic shrub. The photograph was taken by Mr. C. E. C. Cox.

B. B. OSMASTON, I.F.S.

PACHMARHI, *July* 1921.

No. XIX.—THE CRESTED SWIFT (*MACROPTERYX CORONATA*).

The Indian Crested Swift differs in several respects from most other swifts and may be easily recognized by its conspicuous crest and long pointed tail.

In size it is nearly as big as the European Swift, and in colour it is ashy above and white below. The male bird has in addition a chestnut moustachial stripe.

This swift is widely distributed in India and Burma but is nowhere very numerous. They frequent open forest, and especially glades in the forest near water. They are found usually in pairs but sometimes when feeding they may be seen in larger numbers. They are resident and non-migratory so far as my experience goes, being found at all seasons of the year even as far north as Dehra Dun.

The nest is a small shallow half cup fixed in the side of a small branch (often a dead branch is selected). It is composed of little steps of bark cemented together by the saliva of the bird, and is only just large enough to contain the single egg which, as shown in the accompanying photo, projects well above the level of the top edge of the nest.

The birds lay in March and April. The nest in the photo was taken near Allapilli (Chanda) in the Central Provinces.

The birds were observed commencing this nest on March 19th; on March 26th the nest was apparently completed but the egg was not laid till April 11th. The tree selected was a Dhaura (*Anogeissus latifolia*) and the nest was attached to a dry branch about 40 feet from the ground.

It was impossible to get within 8 feet of the nest, and the egg was secured by pushing it gently out of the nest with a long thin stick tipped with cotton wool and used as a billiard cue, the egg being caught in a small butterfly net held

in readiness below the nest. The branch with the nest on it was afterwards broken off. The egg is very faint greyish white, elliptical in shape, and measures 9″ in length.

I am indebted for the photograph to Mr. C. E. C. Cox of the Imperial Forest Service.

B. B. OSMASTON, I.F.S.

PACHMARHI, *July* 1921.

No. XX.—BREEDING OF THE INDIAN PITTA.

Oates at page 285, Vol. II, of his "Nests and Eggs of Indian Birds" says of the Indian Pitta (*Pitta brachyura*). "They also (*i.e.*, besides in Central India) breed, I know, (though I could never find the nests) in the Dun....."

I write to say that His Highness the Nawab of Bahwalpur on the 26th June found the Indian Pitta's nest at a place about half way between the top of the Mohand Pass in the Siwaliks and the foot of the Range on the Saharanpur side near Dehra Dun. The nest was of the usual type described in the books, about 12 feet up in a tree. The eggs were four in number and the only two which it was possible to recover unbroken, as well as one of the broken ones, were perfectly fresh. Mr. C. H. Donald in Miscellaneous Notes No. VI of Vol. XV, No. 3, recorded the finding of a nest of this species with five young in the Kangra District on the 15th June 1917.

R. C. BOLSTER, I.C.S.

TIPPERAH HOUSE, DEHRA DUN,

28*th June* 1921.

No. XXI.—THE CALL OF FRANKLIN'S NIGHTJAR (*CAPRIMULGUS MONTICOLA*) FRANKL.

When writing on the Nightjars of the Punjab I stated (Journal, B.N.H.S. xxvii, p. 369) that I had never heard the call of Franklin's Nightjar but that it was said to be similar to that of *C. asiaticus asiaticus*. While on tour about the middle of this month at the western end of the Kangra Valley I found this Nightjar very abundant in the foothills from Damtal on the Chakki River to Kotli, at heights varying from 1,200—2,500 feet above sea level. It spends the days in seclusion in the light forest and scrub jungle which covers these hills and at dusk comes out to fly about over cultivation and the stony and sandy beds of the torrent nalas. The call which is uttered both at rest and over the wing may be heard all night long, before dark, and even after dawn : in the distance it sounds like a loud grating chirp, which closer at hand resolves itself almost exactly into the sound of a whiplash cutting through the air. It is very distinctive and once heard cannot be mistaken.

DHARMSALA,

21*st April* 1921.

HUGH WHISTLER, F.Z.S.,
Indian Police.

No. XXII.—NIDIFICATION OF THE BLACK VULTURE OR INDIAN KING VULTURE (*OTOGYPS CALVUS*).

Early in May near Mandvi, Cutch, I found a nest of this bird on a small thorny tree barely ten feet from the ground. There was a half fledged young one in it. I took a photograph of the young one in the nest and my wife took one of me taking the photograph.

Murray states that the bird "is said to breed on inaccessible cliffs" but Barnes in his "Handbook to the birds of the Bombay Presidency" states that he has seen their nests in Central India on lofty trees but that he has found nests near Deesa in thick thorny, 'ber' bushes about ten feet from the ground.

My shikarri, Ukha, who has collected birds' eggs for two generations of British Officers and is exceptionally well informed about birds, tells me that the Black Vulture nests in small thorny trees in Cutch but once he found a nest in a large cactus bush and he described how the bush had to be cut away to get at the nest. His story may be accepted as absolutely true.

It would be interesting to have the experiences of other members on the subject and one would like to know if a nest has ever been found on a cliff.

BHUJ CUTCH, E. O'BRIEN, LT.-COLONEL.
21*st April* 1921.

No. XXIII.—SOME CURIOUS NESTING PLACES.

On the 10th of April this year I noticed a pair of hoopoes going into and coming out of a small round hole in the door of an old out-house in my compound in Rawal Pindi. The out-house is half full of old packing cases. I opened the door, which had been locked for about four months, and was surprised to find a hoopoe's nest on the floor in one corner. The nest, containing young birds, was hollowed out of a heap of sawdust and rubbish. I have never before found a hoopoe's nest on the ground, and I think that such a nesting place must be most unusual. There was no smell from the nest, which is usual when the nest is in a hole in a wall or tree. The out-house is not a dark one, as it possesses one large glazed window. As I opened the door one of the birds brushed past me, and flew to the nest. As soon as I walked to the nest, it flew rapidly out of the door, hitting my head with its wing in its flight.

On the 26th of April, Lt.-Col. Lindsay Smith, of the S. and T. Corps, showed me a wild cherry tree near Rowbury's Hotel, Murree, on which he said that he felt

certain a pair of yellow and black Himalayan Grosbeaks were building a nest as he had noticed the birds near the tree on two consecutive mornings. We sat on a culvert about ten yards from the tree and waited. In a minute or two, both birds appeared, and we were able to locate the nest, which was well hidden amongst the leaves of the tree about fifteen feet from the ground. The tree is alongside the road which is a busy one. There are houses on both sides of the tree, and the culvert on which we were sitting is a resting place for numerous coolies as they trek between Kashmir Point and the bazaar. Considering how shy these birds are, and in what dense jungles they usually build their nests, the site selected by this particular pair may be of interest to bird nesters.

In March of this year a pair of sparrow-hawks built their nest and hatched their young in a chir pine tree in my compound in Rawal Pindi. Col. Lindsay Smith tells me that he has never before heard of the sparrow-hawk nesting in the plains of India. There is no doubt as to the identity of this pair that built its nest in my compound.

A. R. B. SHUTTLEWORTH,
LIEUT.-COL.

MURREE, 27*th April* 1921.

No. XXIV.—DESTRUCTION OF BIRDS' NESTS.

Yesterday I found a nest, with eggs, of the Streaked Wren Warbler (*Prinia lepida*), though I was not at the time able to identify the bird. I had no gun, and, after putting a finger in the nest to satisfy myself that there were eggs, I decided to visit the nest again next day in order to be able to secure the bird and make sure of the identification.

To-day, accordingly, I again visited the nest, and this was what I found. Nearly the whole roof of the little egg-shaped nest was torn off and lying alongside of it on the top of the *Kana* grass tuft in which the nest was, also the eggs were completely gone, a close search round about revealing no trace of them.

This complete disappearance of the eggs is not my first experience of the sort with the *Sylviidæ*. What accounts for the disappearance of the eggs, and, especially, what is the reason for the destruction of the nest ?

Human agency may, I think, in the cases which have come to my notice be eliminated. In this case, as in others, no human being saw me at the nest. Even if I had been seen, the ordinary countryman, or country boy, in Northern India, has no interest in small birds and eggs. Nor would any Indian have found the nest independently of me. I once saw a sinister looking lizard, about a foot in length, in a bush in which a nest was, the eggs of which had disappeared ; do such creatures, if enemies of birds, take and destroy eggs, especially where unprotected by the birds ? If so, one would at least expect to find broken egg-shells in the neighbourhood. Birds have been known, I think, to transfer their eggs to or from a nest. Supposing that the birds resent the violation of their nest, is it possible that a bird that builds as elaborate a nest as *Prinia lepida* can find another nest to which to transfer undamaged eggs, or will build another for their reception ? Surely not. If, on the other hand, the bird itself destroys its eggs, why, as before, are the broken eggs not there to show ? And, last of all, if the bird can take the trouble to remove its eggs, what reason has it for destroying its nest ? Fright, despair, anger, etc., would seem to point to destruction of both eggs and nest.

Perhaps some member may be able to enlighten me.

I should add that I found to-day another nest, with eggs, and, after shooting the bird, was able to identify it as *Prinia lepida*. I also found a completed nest without eggs . The time—late July—would appear to be unusual

(see Hume and Oates, Vol. I, pp. 287 to 289) though the *Fauna*, Vol. I, p. 449, does say "March till October."

R. C. BOLSTER, I.C.S.

BAHAWALPUR, 24*th July* 1921.

No. XXV.—BREEDING OF THE KYAH OR MARSH PARTRIDGE (*FRANCOLINUS GULARIS*) IN CAPTIVITY IN BIHAR.

In No. 3 of Vol. XXVII Mr. Stuart Baker writes :—"Mr. Inglis has had these birds in captivity, but has not recorded any success in rearing the young". I am certain I sent Mr. Baker some notes on the breeding of this bird at the same time as I sent him some on the breeding of the Burmese Peafowl (*Pavo muticus*) in captivity, but as he did not quote any of my notes on the latter bird, I presume he must have mislaid the notes on both species.

I was quite successful in rearing the young, and had quite a large family party of these birds, but unfortunately, what with a jungle cat (*Felis affinis*) and a monitor lizard (*Varanus*, sp.) getting into the aviary on different occasions, they all came to an untimely end.

My birds were kept in a large open-air aviary with a masonry house at one end, and in the large room was situated a small reservoir for water and at one end some clumps of "ekri" grass were planted.

The nests were made at the base of these clumps and formed of bits of "ekri" and had a diameter of 6 inches and a depth of 3 inches.

They laid during March and April. One pair had 3 eggs up to the 11th March and again laid on the 13th, 15th and 18th, making a total of 6 eggs. From those, five chicks were hatched on the 14th April, one was killed by a Demoiselle Crane (*Anthropoides virgo*) which inhabited the same aviary, and the others grew up to be fine, healthy birds.

Another pair laid an egg on the 3rd April and on the 6th, but the birds didn't sit well till the 26th ; these two eggs hatched out on the 24th and 25th May.

I believe I sent Mr. Baker another clutch of eggs laid by my birds, but don't remember how many it contained, and I kept another clutch of seven eggs laid during April. This was the largest clutch laid. The latter clutch was laid in 1913, and the other eggs in 1912. My birds also laid during 1910, but I can't find my notes on them. For some unaccountable reason they didn't breed during 1911, which was the same case with my Burmese Peafowl (*Pavo muticus*).

While the birds had chicks they were chiefly fed on millet with some unhusked rice and white ants when obtainable ; they were also able to do a certain amount of foraging in their large open-air run.

When two months old the chicks got white, arrow-shaped streaks bordered with brown on the breast and the feathers of the back were barred and crossed with buff ; also the throat became a pale rufous colour.

BAGHOWNIE FLY, DARBHANGA DT., BIHAR,

26*th May*, 1921.

CHAS. M. INGLIS, M.B.O.U., F.Z.S., F.E.S.

No. XXVI.—THE ADJUTANT STORK AND OTHER MATTERS.

With reference to the note on the Adjutant stork (*L. dubius*) in No. 3, Vol. XXVII of the Journal, it would be interesting to know whether anything is on record with regard to the distribution of these birds. I think it is generally supposed not to range far South, but I recollect seeing this species feeding in company

with vultures on the carcase of a gaur I had killed the day before in the Melghat Forest, south of the Tapti River, latitude 21 40′N. I also found and shot a very large bear (*Melursus ursinus* or *labiatus*) in suspicious proximity to the carcase of the gaur, but did not see any signs of his having fed on it. His presence was revealed by the swearing of monkeys of the langur species, which are usually supposed to confine their bad language to objurgations directed at the felines—tigers and panthers.

During the same expedition I found, written in the book of nature in the plainest language, the history of a herd of gaur which had been stampeded by a tiger, which had killed a cow. There were the tiger's tracks plainly imprinted where the ground, now dry, had been soft with rain, and the hoof marks of the bison as they had thundered off in terror, leaving the unhappy cow to her fate. Nothing but the bones remained, and even the horns had gone, presumably gnawed off by porcupines. The tiger had also killed a vulture whose foul feathers and bones lay near the remains of the kill. Generally vultures will remain perched in the trees above when the tiger is at hand, but this one had evidently been tempted by greed and, venturing too near, had been destroyed with a stroke of the mighty paw.

There were several other interesting and unusual incidents during this expedition, although it lasted only ten days. I was moving camp and started some hours before daybreak one morning, in bright moonlight. I was riding a small pony on a narrow jungle path, accompanied by gun-bearers and other men, when there was a rustling among the dry leaves by the roadside and a bear rushed out at us into the moonlight, giving vent to gruff roars and growls. However, the bear fortunately did not charge home, but turned tail and bolted before I had time to get hold of my rifle. A few hours later, after sunrise, we emerged into the main forest road, and came up with my servants and camp equipage on two bullock carts. I was riding behind the carts when I saw a panther sit up on its haunches under a tree by the roadside, about eighty yards off. It did not seem alarmed, and I jumped off my pony and shot it through the head. I saw in the jungle the same day a small animal which I recognised as a lesser civet cat, the only one of the species I have seen. The same day I saw two Rattels *M. indica* ; I had previously seen one in another part of the same forest swimming about in a pool of water in the middle of the night.

The panther I killed had a mate which visited my camp that night ; I tied up a goat near the well, hoping to get a shot, but the goat, perhaps frightened by the panther, jumped into the well and hanged itself. A bear came into the camp the same night. I ran after it, barefooted, but it plunged into the shades of the forest, and I did not get a shot. I was shown, when out on this occasion, the head of a fine old bull gaur that had been killed by a tiger. The aborigines said that it had put up a great fight, and perhaps this accounted for the condition of a tiger shot by an officer of the Royal Artillery in this locality not long afterwards. For this tiger had one eye gouged out, evidently in an encounter with some other wild beast.

R. G. BURTON,
BRIGADIER-GENERAL.

30*th May* 1921.

No. XXVII.—MANIPURI NAMES OF CERTAIN BIRDS.

In referring to text books on game and other birds, I have always noticed how inaccurate are the Manipuri names given therein. I enclose a list of the Manipuri names of certain birds which, if you think it worth publishing in the Journal, may be of use to future writers of text books. The names were collected mostly from shikaris and beaters, during my nine years' stay in the Manipur

State, and the majority were checked with the help of an educated Manipuri, so the list can be taken as fairly accurate.

J. C. HIGGINS, I.C.S.

NOWGONG, ASSAM, 20*th May* 1921.

Peacock (*Pavo cristatus* or *muticus*) ..=wāhong.
Red jungle Fowl (*Gallus ferugineus*) ..=lamyel (means, "wild fowl").
Domestic Fowl .. ..=yel, yen.
Mrs. Hume's Pheasant (*Phasianus humiæ*). =nuining, nongin.
Black-breasted Kalij (*Gennæus horsfieldi*) ..=wābā.
Black Partridge (*Francolinus vulgaris*) ..=urenbi.
Chinese Francolin (*Francolinus chinensis*) ..=kabo urenbi (the partridge of the Kabo or Kabaw valley, in the Upper Chindwin District of Burma, which adjoins the Manipur State).
Bamboo Partridge (*Bambusicola fytchii*) ..=wākrek (wā=bamboo, krek=the sound made by the bird).
Quail .. ..=shorbol (different species not distinguished).
Grey lag goose (*Anser ferus*) .. ..=kāng-ngā.
Bar-headed Goose (*Anser indicus*) .. ..=kāngshel.
Duck (generally) .. ..=ngānu.
Pochards (*Netta rufina, Nyroca ferina, Nyroca fuligula, Nyroca bæri, Nyroca feruginea*) .. ..=irupi (means, "diver") (also, locally, athāobi).
Whistling Teal (*Dendrocycna javanica*) ..=tingi.
Ruddy Sheldrake (*Casarca rutila*) .. ..=thāng-gong.
Cotton Teal (*Nettopus coromandelianus*) ..=ngānu pegdek (ngānu=duck, pegdek, from the sound made by the bird).
Wigeon (*Mareca penelope*) .. .. ..=thāng-gong-māl (means, "like the ruddy sheldrake" referring to the similar colour of the head).
Shoveller (*Spatula clypeata*) .. ..=Kharā, khārā.
Pintail (*Dafila acuta*) .. .. ..=leitung-ngā.
Spot-bill (*Anas pœcilorhyncha*) .. ..=ngānu pirel.
Gadwall (*Chaulelasmus streperus*) .. ..=thoiding-nam (means, "tastes of sesamum").
Garganey Teal (*Querquedula circia*) ..=surit.
Common Teal (*Nettium crecca*) .. ..=surit (also locally, leingangehābi.)
Spoon-bill (*Platalea leucorodia*) .. ..=thāroichābi (means, shellush eater).
White Ibis (*Ibis melanocephala*) .. ..=māyang urok (means, "egret from Cachar).
Black Ibis (*Inocotis papillosus*) .. ..=kaksu.
Common Heron (*Ardea cinerea*) .. ..=usai.
Common Pond Heron (*Ardeola grayi*) ..=lamprā.
Chinese Pond Heron (*Ardeola bacchus*) ..=lamprā.
Cattle Egret (*Bubulcus coromandus*) ..=san-dung-il (means, "following after cattle").
Large Egret (*Herodias alba*) .. .. ..=loklenba (means, "standing in streams).
Smaller Egret (*Herodias intermedia*) ..=lāng-khong-sāng (khongsāng=long legs).

Little Egret (*Herodias garzetta*) .. ..=naokang.
Egret (generally) .. ..=urok (means, "stream bird").
Night Heron (*Nycticorax griseus*) .. ..=chongkhu.
Sarus (*Grus antigone, Grus sharpii*).. ..=woinu, woinuren.
Common Crane (*Grus communis*) .. ..=woinumāl (means, "like a sarus").
Coot (*Fulica atra*) .. ..=porom, ngānu porom.
Moorhen (*Gallinulu chloropus*) .. ..=urel.
Purple moorhen (*Porphyrio poliocephalus*) .=umu.
Woodcock (*Scolopax rusticola*) .. ..=sābal koudrak.
Woodsnipe (*Gallinago nemoricola*) .. ..=checklaobi, checklaobi amuba (amubā=black).
Snipe (*Gallinago solitaria, Gallinago cœlestis, Gallinago stenura, Gallinago gallinula*) ..=cheklaobi (means, "calls Chek")
Painted snipe (*Rostratula capensis*).. ..=kangdruk.
Redshank (*Totanus calidris*) .. ..=ngāhoibi.
Burmese Red-wattled Lapwing (*Sarcogrammus atrinuchalis*) .. ..=salangkāk.
Yellow-wattled Lapwing (*Sarciophorus malabaricus*) .. ..=salang.
Eastern Golden Plover (*Charadrius fulvus*) =nong-gāng.
Pheasant-tailed Jacana (*Hydrophasianus chirurgus*) .. ..=yempārābā (means, "cock bird")
Sandpipers, snippets (generally) .. ..=chessa, chegaibi (generally the former is the Muhammadan term, the latter the Hindu).
Pelican (*Pelicanus phillipensis*) .. ..=uphong.
Pigeon (generally) .. ..=khunu.
Wild pigeons & doves (generally) .. ..=lamkhunu.
Mynas (generally) .. ..=chong-ngā.
Kites (generally) .. ..=umaibi.
Hawks (generally) .. ..=khunu karang.
Crow (*Corvus macrorhynchus*) .. ..=kwāk.
White-backed Vulture (*Pseudogyps bengalensis*) .. ..=langdyā.
Sparrow (*Passer domesticus*) .. ..=sendāng.
Swallows, swifts, martins (generally) ..=sembāng.
Bulbuls (generally) .. ..=khoining.
Hoopœ (*Upupa indica*) .. .. ..=songārābā, sangairābā.
Wagtails (generally) .. ..=khongrangchāk (regarded as an incarnation of Durga).
Magpie robin (*Copsychus saularis*) .. ..=Uchinao.
Parrots (generally) .. ..=tenuwā.
Black drongo (*Dicrurus ater*) .. ..=charoi, cheiroi.
Cuckoo (*not* hawk-cuckoo) .. .. ..=kokin.
Cormorants (generally) .. .. ..=urā.
Indian darter (*Plotus melanogaster*) ..=urā-limāl (means, "cormorant like a snake").
Yellow-legged herring-gull (*Larus cachinnans*)=taotra.
Great crested grebe (*Podicipes cristatus*) ..=kumphengbi.
Dabchick (*Podicipes albipennis*) .. ..=upum.
Crow-pheasant (*Centropus sinensis*) ..=nongkoubi.
Chestnut-bellied munia (*Munia atricapilla*) =ushuk.
Terns (generally) .. ..=ngārakpi (means, "fish-catcher,")
Kingfishers (generally) .. .. ..=ngārakpi.
Pied kingfisher (*Ceryle varia*) .. ..=ngārakpi, wākrek.
Owls (generally) .. ..=maku.

Note.—ā is pronounced long.

No. XXVIII.—CROCODILE SHOOTING IN NEPAL.

We were floating down the Gunduk between Nollpur, in Nepal, north of the first sandstone range and Tirebani, the head-works of the Ramnuger-Tirebani canal, trying to shoot a few of the hundreds of crocodiles that lay basking in the sun on the edge of the stream. The banks all along this part of the river are rather steep and even if a mugger is shot dead, the weight of his body carries him in and he is gone. We lost several in this way, one was particularly aggravating. We had spotted a gharial (*gavialis gangeticus*) lying on rather a flat sandy bank, some 200 or 300 yards down stream, so I waited till we had floated to within a 100 yards or so and could get a broadside shot, then I fired and hit him in the head. I thought I had surely got him this time as he lay quite still, then just as we got the boat close to where he lay, he struggled into the river turning as he reached the water on his back with the lower half of his jaw sticking out of the water. Then he started to swim straight across the river to the opposite shore on his back. I fired several shots at him in the hopes that he might stop, when he could be roped. He had reached about mid-stream still on his back when he suddenly dived and we saw him no more. I suppose he floated up a few days later to provide a meal for the Tarus, who greatly appreciate crocodile flesh, which is white, not unlike cod to look at, though rather tough I should imagine.

There were both gharials and muggers (*C. palustris*) all the way down the river, though chiefly gharials which seemed to prefer lying together in shoals while the muggers were in ones or twos.

The natives are very much afraid of them and even when dead it requires a lot of persuasion to make them touch one. I shot quite a small mugger in a *tal* in the Kheri district—its neck was broken and it was dead, but muscular action made it open and shut its eyelids and none of the natives would touch it, till our orderly bravely got down off his elephant, and after thoroughly kicking it and satisfying himself that it was dead, picked it up at arms length ; then one or two others plucked up courage and rather gingerly helped him to load it on an elephant. The mahout was in a fearful state of nerves and paid far mere attention to what the dead mugger might do than to where his elephant was going. The crocodile certainly did open its eyes once or twice and even after it was skinned some muscles moved and its heart appeared to be still beating.

We watched some fishermen working on the Gunduk one day. They chose a likely looking pool in the river, then quickly rowing up stream to start with, they ringed the pool paying out, as they went, a net weighted along one edge and floats attached to the other, then wading waist deep into the river they started hauling it in. As it was drawn nearer and nearer in, a sudden swirl on the surface of the water and a glint of silver betrayed the presence of at least one fish. In that particular catch there was only one, quite a good mahseer about 10 lbs.

Most of the small rivers and streams in Nepal are trapped to such an extent that there are few fish left. The Tarus build stone dams right across the stream forcing all the water through narrow channels, at the end of which are wicker-work cages in which the fish get caught.

I. A. K.

No. XXIX.—AN AGGRESSIVE PHOORSA (*ECHIS CARINATA*).

In mid-June walking across an open maidan near St. Thomas' Mount in the dusk my wife and dog walked right over an *Echis*. They, at least my wife was alarmed by the "sandpaper noise" jumped clear and called to me. I found the snake furiously angry, lashing out and scrubbing his sides together. I wanted to catch him, but had nothing but a thick, and for such work, clumsy walking stick. While I was hesitating the snake made towards me giving a great exhibition of frightfulness. He came slowly, his action having a scrambling

appearance due to his having to scrub his sides together. He evidently mean business and came on for some 8 to 10 yards when I, not fancying the job of trying to handle such a furious beast in a failing light, killed him. I have never seen this snake adopt such a curious and saggresive attitude before. He was beautifully marked and had a clear skin. The brown and buff showing each other up well and clearly. A female, non-gravid.

A. G. FRERE, I.A., Major.

ST. THOMAS' MOUNT,
4th June 1921.

No. XXX.—THE ENEMIES OF BUTTERFLIES.

A note by Mr. C. Dover, under the above heading, appeared in Vol. XXVII, No. 3, pages 642-3 of the Journal.

One of the most important of destroyers of butterflies has been ignored in the article, in the spider. Not only the spinners but also some of the hunting spiders (notably the jumping spiders) and those that lie in ambush among flowers (the crab spiders and the *Peucetia*) live very largely on butterflies.

The house lizard is stated by Mr. Dover as only a casual butterfly eater. I think that creature would eat all lepidoptera freely, but from its habits it is mostly moths that come in its way. I have seen a large, vigorous specimen of a hawk-moth taken and devoured by the common gecko.

I imagine that one reason why birds do not feed to a greater extent on butterflies is their difficulty in catching them. The flight of butterflies is either erratic or very swift and there is so much more expanse of innutritious wing, that breaks off uselessly in the beak, than solid, satisfying body, that actually to arrive at possession must be rather difficult to achieve. Nevertheless, most field naturalists have at times witnessed the attempts of birds to catch butterflies. Probably they desist when experience has taught that the result of a very occasional success does not justify the numberless futile efforts.

C. E. C. FISCHER,

PALMANER, *5th June* 1921.

No. XXXI.—BUTTERFLY NOTES.

The following instances of butterflies taken by me in new or unusual localities may be of interest.

In Purulia (District Manbhum, Bihar and Orissa) I caught the following :—*Appias wardi*, M. ♀ and *Cirrochroa aoris*, Db. (♀ in battered condition) in June 1917 ; *Pantoporia ranga*, M. (perfect specimen) in April 1918.

Mourbhanj State Orissa.—Lt.-Col. (then Captain) W. H. Evans, R. E., referred in his 'Notes on Indian butterflies ' (Vol. XXII of the Journal, p. 770) to some butterflies caught by me in this State on the Megbasini hills. I subsequently got from this same district, both ♂ and ♀ of *Poritia hewitsoni*, M., while in a box recently sent to me by Mrs. E. G. Beckett of Sambalpur I got the following butterflies from these same hills :—*Papilio helena cerberus*, Fd. (♀) ; *Eulepis eudamippus*, D. (♀). There were also in this box some further specimens of *Apatura parisatis*, God ; *Papilio chaon*, Wd. ; *Papilio paris*, L. ; and *Papilio doson axion*, Fd.

At Sea—Having left Bombay per S.S. City of Karachi on 20th August 1919, we were off the coast of Arabia, but quite out of sight of it, when (on 26th August), a *Vanessa cardui*, L., came on board, and was brought to me by a friend to whose clothes it had clung.

W. M. CRAWFORD, I.C.S.

BELFAST, *25th May* 1921.

No. XXXII.—BUTTERFLIES AT SEA.

A voyage from Karachi to Bombay on October the 28th, 1921, was remarkable for the numbers of Butterflies seen all day. From breakfast time onwards, some half a dozen or more insects were to be seen on the wing all day in about the length of the boat. In the afternoon they were decidedly more numerous, and at about 4-30 p.m., when opposite Madiapur on the Kathiawar Coast, at a distance estimated by the Captain as five to six miles the ship passed through an immense flight for some minutes. They were so thick that the Captain on the bridge had to brush them away from his face. The sea was strewn with many hundreds, and many fell on deck in such an exhausted condition that I picked them up in my fingers. The large majority, however, still flying strong continued their migration. During the whole day these insects were flying due East to the Indian Coast where had they come from the nearest land to the West, *viz.*, the Arabian Coast is many hundreds of miles distant, and one cannot believe they travelled so long an expanse of sea without food or rest. Had they flown South from the Persian Coast, and then changed direction East. This seems unlikely as the Persian Coast at 4-30 p.m. must have been two hundred miles distance. Had they been blown out to sea by a strong Western current, and driven back by a reverse current ? Probably. The predominant species all day were *Terias hecabe*, and a white species probably *Anaphæis mesentina*. Those actually identified having settled on the ship were *T. hecabe*, *Junonia lemonias*, *Papilio demoleus*, *Papilio aristolochiæ*, *Hypolimnas misippus*, *Colotis amata*, a *Euploea*, probably *core*, and a *Hesperid*. I think I also recognised *Junonia hierta* on the wing.

F. WALL, Colonel, I.M.S.

Bangalore, 1*st December* 1921.

No. XXXIII.—ON THE HABITS OF A *SCELIPHRON* WASP (*S. DEFORME*).

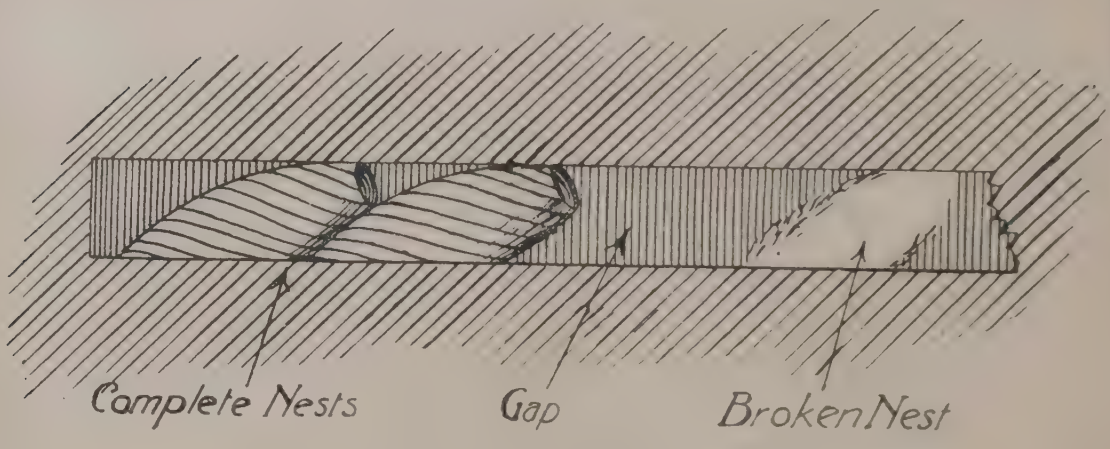
I give below a few observations made on a *Sceliphron* wasp. I have not made a special study of *Hymenoptera*, but this species of wasp seems to be a common visitor to the house and its interesting habits have led me to make a few notes. I could not fix the identity of the wasp with certainty, and thought it was a *Sceliphron madraspatanum*. I sent a specimen to the Society, which was identified as coming close to *Sceliphron deforme*, Sm., (*Sc. formosum*, Bingh., Fauna of Brit, Ind., Hymn., Vol. I, pp. 239-240), and that " identical specimens of this species were obtained in the Murree Hills." I am much obliged for this kindly assistance.

I have made a few diagrams, but these, I fear, are merely rough drawings, and are not exactly works of art. I hope, however, that they will serve the purpose for which they are intended—that of making my written note clearer and easier to follow. I have also had five cells photographed so as to convey a better idea as to their beauty.

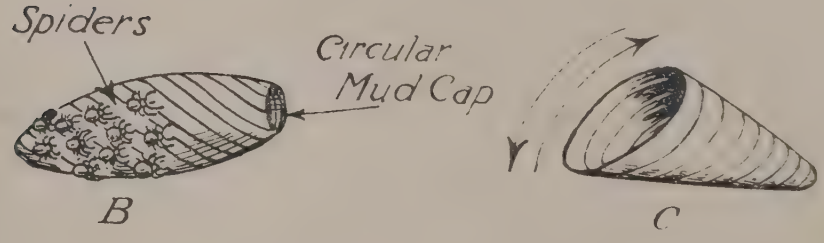
In my bedroom alone several specimens of this *Sceliphron* have been busily engaged for the last two months. There are several groups of cylindrical mud cells fixed on various parts of the ceiling, and I have seen two insects working at the same time and independently of one another. I assume, therefore, that each lot of cells belongs to one insect, and that one wasp does not possess two or more lots of these strange and beautiful mud structures.

Number and Distribution of Cells.

On making an examination of the ceilings of the other rooms in my house, I



A



B C

A.....Nests on wood of ceiling
B.....Nest stored with spiders
C.....Nest in course of construction showing manner in which wasp builds.

found several more cells. The following shows the distribution of the cells in the ceilings of the rooms examined :—

1st Room (Bedroom).

(1)	A single cell.		
(2)	,, ,,		
(3)	A collection of cells	.. ..	2 in number.
(4)	,, ,, ,,	.. ..	2 ,,
(5)	,, ,, ,,	.. ..	2 ,,
(6)	,, ,, ,,	.. ..	2 ,,
(7)	,, ,, ,,	.. ..	5 ,,
(8)	,, ,, ,,	.. ..	5 ,,
(9)	,, ,, ,,	.. ..	15 ,,

2nd Room.

(1)	A single cell.		
(2)	A collection of cells	.. ..	2 in number.
(3)	,, ,, ,,	.. ..	2 ,,
(4)	,, ,, ,,	.. ..	2 ,,
(5)	,, ,, ,,	.. ..	3 ,,
(6)	,, ,, ,,	.. ..	4 ,,

3rd Room.

(1) A collection of cells .. .. 2 in number.
(2) „ „ „ .. .. 3 „
(3) „ „ „ .. .. 11 „

Thus the total number of cells is 65—a comparatively large number.

Site of Cells.

The ceiling of my bedroom, as also of the other rooms, is made of polished boards, and the cells have, in most instances, been built at the junction of the roof proper with the additional planking placed below and, in some cases, at the junction of this planking with the thick ridge of wood that runs all round the rooms where the wall meets the roof. This seems to indicate that this site is selected by preference, although the cells are not invariably placed on the ceiling. I have seen cells built on the plaster of a wall, on the underside of the machinery box of a gramaphone, and also on a haversack! But, perhaps, the strangest place chosen is that which a friend told me of, inside the sleeve of a coat!

Arrangement of Cells.

There seems to be some sort of method followed by this wasp in the manner in which it arranges its cells in groups. These structures are usually placed in a line—the back and upper portion of one touching the front and lower portion of the other. They all face in the same direction, and are all at a slight angle. It should be mentioned that they do not always form a continuous line, as there are gaps sometimes. This may be due to the fact that one of the cells has collapsed at an incipient stage of its construction, or that the place where a cell would naturally have been built is unsuitable for some reason or other. At first I thought that the wasp invariably arranges its cells in a line as just described, but one day I noticed a group of cells made by this wasp in an office (in the topmost storey of the building). I was rather astonished to find that one cell was built directly above another! This is the only instance in which I have found the cells so arranged, and I suppose this must be an exception to the usual style. Subsequently a friend of mine, who mentioned that there were cells built in various parts of his house, showed me a fine series of cells which differed not only in arrangement, but also as to site. I have already mentioned the different places in which I saw these cells. As to their arrangement, I found that there were two distinct styles: (a) the usual line and (b) in a line, side by side, but *vertically*, *i.e.*, the line of cells runs vertically, the cells themselves being horizontally placed. We see, therefore, that the cells may be arranged according to three distinct styles:

(*a*) in a line *horizontally*—the usual arrangement.
(*b*) in a line *vertically*—not uncommonly.
(*c*) one above the other—seldom.

Manner in which Cells are built.

The manner in which this wasp works is interesting. It flies to its row of mud buildings and commences operations with a loud, high, buzzing sound. By this noise it usually indicates its presence. It carries a small quantity of mud (or really light grey clayey soil) which it slowly begins to fashion into a cylinder. The wasp first lays a ring of mud on the wood and then begins adding to this in successive layers. Each layer is about one-sixteenth (?) of an inch thick, to judge from the faint ridges one sees on a dry and complete structure. The wasp, when it brings a lump of soil with it, starts on one side and works upwards to the top of the circular arch, working down again from this point to the place from where it started. Thus half of the arch is built up at a time. I have attempted to illustrate this by a diagram. The wasp continues to add fresh layers until the structure attains a length of a little over an inch. By this time, of course, it has taken the shape shown in the drawing and in the photograph—a sort of cylinder widest at the middle with narrower ends. When the wasp has finished it decreases its ends off by leaving a very neat circular hole at end of the cell—

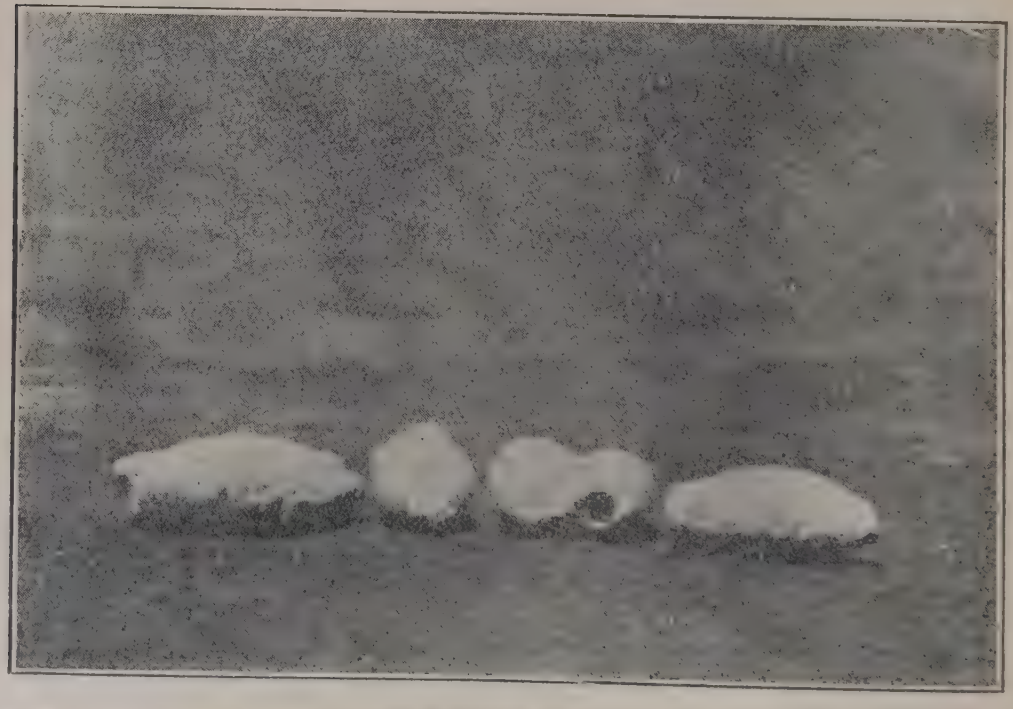
the other end, *i.e.*, the end from which it started, being closed from the first. When a structure has reached this practically complete stage, with one end open, it is left to dry. When the wasp has used up its load of clay in adding a layer, it invariably goes inside the building. Why it should do this I do not know; either to push the wall outwards to prevent a collapse, or merely for inspection! As far as I have been able to observe, this wasp works at the construction and storage of its cells during the hours of daylight. As soon as the sun sinks it leaves off although it is still quite bright and darkness has not set in. During the night the wasp is not anywhere near the cells and does not come near them till the following morning.

Storage of Cells.

After a cell has been finished and has dried, it is filled with food (for the larva) which consists of spiders. The spiders were very kindly examined and identified by Dr. Gravely. A male has been identified as a member of the *Oxyopidæ* family and almost certainly as a member of the genus *Oxyopes*, while females belonged to the *Clubionidæ*. A closer identification could not be given as the spiders obtained by me were in a very damaged condition after the ravages of the larva. I have sent some more spiders* which I trust will be in a better state and will not be so difficult to determine. The spiders usually stored belong to the *Oxyopidæ* and *Clubionidæ* families, but one day I saw a wasp carrying a spider to its cell, and on making the wasp release the spider, I found that it was of quite a different species to that usually collected. I sent it to the Society for identification and was informed that it was a species of *Araneus*. I broke a newly constructed cell to see if the spiders were put in at the same time as a layer of mud was added, but found that the cell was empty.

Breeding of Larvæ inside Cells.

On examining the contents of some cells I found that after they had been elled with spiders, an egg is laid, which develops into a small white larva. This



*These spiders sent have been identified by Dr. F. H. Gravely of the Madra Museum—one specimen belonged to the genus *Araneus* (=*Epeira*) and six t the Salticid genus *Rhene* and three remaining specimens were immature Thomisids

larva grows inside its temporary prison, and as it develops it feeds on the spiders. It grows until it forms a thin, brown, membraneous casing round it, after the manner of a butterfly chrysalis, and if this casing is broken, it reveals the larva inside. The chitinous covering surrounding the larva seems to be enveloped in a fine, flimsy, woolly web. From the chrysalis the imago emerges, but I have not yet seen an insect in course of emergence. It is difficult to ascertain exactly how long it takes for an egg to become an insect, because the contents of a cell cannot be examined unless it is broken, and when this is done, all further observations on that particular cell have to be concluded, and another has to be found with the larva it contains in a more advanced stage than the larva in the cell previously examined. I regret very much that I cannot supply definite and accurate information as to the duration of larval life of this wasp. Arguing from analogy this period ought to be about a fortnight, while the time taken for an imago to develop from an egg would probably be from about four weeks to a month ; but evidently this *Sceliphron* takes longer to develop, as a large number of cells I have seen were built about two months ago and no wasp has emerged from any of them yet. Some of the cells I have sent the Society are full and advantage may be taken of this to ascertain the duration of larval life.

Difference in Habits from Sceliphron madraspatanum.

While considering the habits of this *Sceliphron* it would not perhaps be out of place to make a few remarks with reference to the habits of *Sceliphron madraspatanum*. In "Indian Insect Life" there is a most interesting account of the latter species, and with reference to the remarks therein made, the following outstanding points of difference in the habits of this *Sceliphron* and *Sc. madraspatanum* have been observed :—

(1) The total number of cells made by *Sceliphron madraspatanum* is apparently not more than seven, but in the case of this *Sceliphron* I have shown that as many as fifteen cells are built ;

(2) When all the cells are complete they are not coated with a layer of mud as is done in the case of the cells made by *Sceliphron madraspatanum* ;

(3) When a wasp is unable to complete the task of filling in a cell with spiders, it does not put a temporary mud covering over the mouth of the cell as is done by *Sc. madraspatanum* ;

(4) Taking the illustration given in "Indian Insect Life" of cells of *Sc. madraspatanum* as depicting typical cells of that species, there is a great difference in general appearance between them and the cells made by the species at present written about. The cells of *Sceliphron madraspatanum* arebigger and coarser looking, the layers being distinctly visible, and, moreover, the manner in which the cells are grouped together is quite different, as will be seen by a comparison between the illustration referred to and the diagrams appended to these notes.

Mr. Ellison asked me to try and send the Society, for exhibition purposes, some cells of this *Sceliphron*. After several unsuccessful attempts I have at last succeeded in removing five cells whole, and I trust that these will be fit for exhibition in the Society's rooms.

In conclusion, I have no doubt that my observations and notes must necessarily be imperfect, but as I have already stated, I am not an entomologist, and I have written this note because the *Sceliphron* wasps are very interesting and also form an important genus from an economic point of view, and that, therefore, any notes on their habits would probably be of some interest.

S. BASIL-EDWARDES.

SIMLA, *8th July* 1921.

No. XXXIV.—AN UNDESCRIBED NATURAL ENEMY OF THE CASTOR SEMILOOPER (*ACHŒA* (*OPHIUSA*) *MELICERTE*, HMP.)

(*With a plate.*)

The semilooper caterpillar of the noctuid moth *Achœa* (*ophiusa*) *melicerte* Hmp. is a common and well known pest of the castor oil plant (*Ricinus comunis*) all over India. In many parts of the country, especially in S. India, this caterpillar is kept in check by an important natural enemy—a hymenopterous parasite. In certain seasons this parasitic wasp has been found to exercise a very effective natural control over this pest, as many as seventy or eighty per cent. of the caterpillars being found dead in the castor plots. The presence of this parasite is easily detected in the fields by the characteristic appearance of its cocoon found attached as a sort of cushion underneath the tail end of each victimised caterpillar (see fig. 3).

Though this parasitic wasp has been known to entomologists in India for some years past, it is curious that it has not been identified or described anywhere till now. This is, of course, due to the fact that very little systematic work has been done by any one on the parasitic hymenoptera, a group of insects of first rate importance as natural enemies of various crop pests, and especially of the forms belonging to the family ' Braconidœ '. For some time past I have been paying some attention to these insects and trying to do some systematic work and as far as I can make out from available literature, this insect does not appear to have been named or described anywhere. There are references to it in recent works on Indian Entomology, but everywhere without a name of its own. I have therefore attempted to publish the following description of the insect in this short paper. Though I have been able to classify the insect down to its sub-family and genus with the aid of the valuable synoptical tables of authors like Ashmead, Marshall and Szepligeti, I was in some doubt as to whether it really belonged to the genus ' Microplitis ' or to one of the very closely allied genera ' Diolocogaster ', ' Microgaster ', or ' Hygroplitis ', and wanted to get my determination confirmed. Mr. H. L. Viereck of the U. S. A. Department of Agriculture, to whom I submitted specimens very kindly examined them and confirmed my identification that it belonged to the genus ' Microplitis '. I take this opportunity of expressing my thanks to this Entomologist who is a well known authority on the family :

Family—Braconidœ.
Sub-family—Microgasterinæ.
Genus—Microplitis, Förster.

Microplitis ophiusœ—nov. sp.

Colour.—General colour shining black clothed with thin silvery pubescence which is more pronounced at the sides of the thorax. Head : black ; palpi fulvous ; face covered with very scanty silvery pubescence ; ocelli brownish; antennæ : scape brown, flagellum dark rufescent. Thorax black : with shining silvery hairs at the sides ; front legs ferruginous excepting the coxa and trochanter which are dark ; the tibiæ and tarsi of the second pair of legs ferruginous, the other joints dark to fuscoferruginous ; the hind legs uniformly fuscoferruginous, the tibial-spurs fulvous. Fore wings : smoky hyaline and irridescent, stigma dark brown, a fuscous cloud below the stigma and a very light infumation on the discoidals ; hind wings hyaline, very lightly infumated along marginal region. Abdomen : for a third of its length at the proximal portion both above and below, of a light yellowish white colour, excepting a narrow middorsal longitudinal patch which is shining black ; the rest of the abdomen black.

General Structural Features.—Head : from above quadrate, almost as broad as thorax ; face and occiput closely and coarsely punctured ; antennæ slightly longer

Fig. 1.

Fig. 2.

Fig. 3.

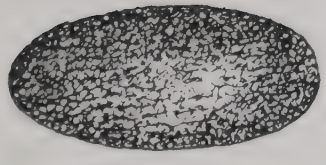


Fig. 4.

Fig. 5.

Fig. 6.

An undescribed natural enemy of the Castor Semilooper.
Achoea Ophiusa) melicerte, Hmp.

than the body, not cylindrical, slightly impressed ; clypeus prominent ; eyes large, edged with short silvery hairs. Thorax : coarsely and closely punctured above ; the disc of mesonotum with three distinct paraspidal furrows which are more or less crenated; along the pleuræ on each side there are two rows of distinct shining black crenate foveæ, one lateroventral row extending from the pro to the mesopleura, and the other latero-tranverse from below the tegulæ downwards and backwards along the mesopleura : the space between these two rows is in some specimens smooth and shining black ; scutellum gently grooved ; post scutellum with distinct deep longitudinal striations ; median segment coarsely and deeply reticulate. Wings :—radius very faintly distinct ; the 2nd cubital small and triangular with the apex of the triangle rounded ; 3rd cubital faint, nervures hardly reaching apex of wing. Hind limbs comparatively longer, with the femora and tibiæ somewhat incrassated ; the tibial spurs very short. Abdomen : subsessile, proximal portion somewhat narrow ; segments soft and shrunk in dead specimens, so that the boundaries of the first few segments are not clearly defined ; in shape, abdomen slightly impressed dorso-ventrally ; smooth and shining ; the tubercle on the first segments is seen as a small shining faint projection. In the female, terebra seen as a very small pointed piece at the penultimate ventral segment which is slightly conical.

Length : 3 mm. ; wing expanse 7 mm. Cocoon 4 mm. long ; elongate oval, more or less cigar-shaped but with the poles bluntly rounded ; greyish brown, strongly felted, not fluted as in the case of many other species of the genus ; the adult emerges through one end by cutting off a circular lid. As mentioned above the parasite is solitary, only one cocoon being found attached to each caterpillar.

The insect is a short, robust wasp, dark in colour with the portions of the abdomen and thorax shining ; the distinct crenate foveæ at the pleuræ, the small triangular 2nd cubital cell of the wing, and the nitid yellowish colour of the base of the abdomen are features which easily distinguish this insect. Lefroy makes mention of this parasite in his monograph on the castor semilooper, (Memoirs of the Department of Agriculture Vol. II, p. 73) but without any name, and a figure of it appears on plate VII (fig. 7) of the monograph.

The great majority of the species of *Microplitis* recorded till now are European and N. American, and none has been recorded from the Indian region ; but it is not unlikely that more species of this interesting genus will be found in different parts of India.

I believe it may not be out of place in this connection to add a note regarding other parasitic wasps that have been recorded from India, as having been reared out of this caterpillar so far. At the time Lefroy wrote his paper apparently this was the only parasitic wasp reared on this caterpillar. The following have since been found :—

Paniscus lineatus, Br.—Ichneumonid—reared on the castor semilooper at Coimbatore by myself.

Microtoridea lissonota, Vier.*—Ichneumonid—reared on castor semilooper in Mysore by Dr. Coleman.

Zamesochorus orientalis, Vier.*—Ichneumonid—reared on castor semilooper in Mysore by Dr. Coleman.

Tetrastichus opiusæ, Craw.*—Eulophidæ—reared on castor semilooper in Mysore by Dr. Coleman.

I am inclined to think that one or two of these might be hyperparasites on *Microplitis* especially *Zamesochorus* ; for, there are records of species of *Mesochorus* (a closely allied genus) noted as hyperparasites on species of *Microplitis* in Europe and America. This might be verified in course of time when further observations are made of the castor caterpillar and its natural enemies. In page 8 of Pusa Bulletin 89 on " Second Hundred notes on Indian Insects " Mr. Dutt has recorded an Ichneumon parasite *Edrisa pilicornis* Cam., which has been

* See Proceedings of U. S. National Museum. Vol. XLII.

definitely found to be a parasite on *Microplitis ophiusæ* and killing as many as 72 per cent. of this beneficial insect.

Since the preparation of this description in January and the subsequent submission of it for publication in this journal, I have recently seen a paper by Lyle on three Indian Braconids in the " Bulletin of Entomological Research " for September 1921 ; and of the three described from him one ' *Microplitis eusirus* ' appears more or less to be the same described in this paper, but I have not seen named specimens and so am unable to confirm the same. The specimens seen and described by Lyle are North Indian forms sent from Pusa.

Explanations of Figures.

1. Semilooper caterpillar on castor leaf.
2. The moth of same *Achœa* (*Ophiusa*) *melicerte,* Hamp.
3. A parasitised caterpillar with the cocoon of the parasite attached at the tail end.
4. Cocoon of the parasite.
5. The parasitic wasp—*Microplitis ophiusæ,* Ram—dorsal view.
6. The same—side view of thorax to show crenated fovea.

T. V. RAMAKRISHNA AIYAR,
Assistant Entomologist.

COIMBATORE, 28*th February* 1921.

PROCEEDINGS

OF THE MEETING HELD ON THE 2ND AUGUST 1921.

A meeting of members and their friends took place on Tuesday, the 2nd August 1921, Mr. R. A. Spence, M.L.A., F.Z.S., presiding.

The election of the following 43 members since the last meeting was announced :—Mr. Labhsing, Allapili, P. O. ; Mr. C. D. A. Caldecott, I.F.S., Betul, C. P. ; Miss J. Procter, England ; Capt. R. L. Issacs, Bombay ; Mr. J. M. Sladen, I.C.S., Belgaum ; Capt. K. J. H. Lindop, M. C., Belgaum ; Mr. J. Fitzpatrick, Ahmedabad ; Lt.-Col. M. G. Barker, Belgaum ; Mr. C. B. B. Clee, I.C.S., Belgaum ; Capt. B. R. Chaudhri, I.M.S., Ladha ; Mr. Sydney Julius, Colombo ; Capt. K. S. Bonsle, Sawantwadi ; Mr. C. T. Trigg, Jalpaiguri ; Mr. S. Seymour King, Madras ; Lt.-Col. W. Stirling, C.M.G., D.S.O., Belgaum ; H. H. the Nawab Sadiq Mahomed Khan Abassi, of Bhawalpur; Major C. P. F. Warton, Bombay ; Major J. E. Laurie, England; Mr. Nagamichi Kuroda, Japan; Lieut. R. A. Grant, Bombay ; Lieut. H. O. Banfield, R.I.M., Bombay ; Major E. C. Hodgson, D.S.O., I.M.S., Bombay ; Mr. W. Meiklejohn, I.F.S., Nowgong, Assam ; The Librarian, Police Memorial Library, P.O. Surada ; Mr. R. F. Cockburn, Calcutta ; Mr. H. B. Simons, Bangalore ; Kumar Shri Godji, Bhuj, Cutch. (Life member) ; Capt. B. A. S. Brunskill, Bombay ; Mr. C. L. Campbell, Basra ; Mr. C. Rowson, Munnar, P. O. ; Mr. D. F. Stileman, Salem ; Lt.-Col. J. Deane Drummond, D.S.O., Travancore ; Dr. M. L. Freeman, Madras ; Mr. S. B. Hickin, Bhatgar ; Capt. Maharaj Kumar Sri Sadul Singhji Bahadur of Bikaneer ; Mr. H. M. Griffiths, Delhi ; Mr. R. R. Proud, Calcutta ; Mr. E. Warwick, Sat Tal, *via* Bhimtal, U. P. ; Lt.-Col. H. Grisewood, Bombay ; Capt. V. Davies, I.A., Rangoon ; The Mess Secretary, Staff College, Quetta ; Mr. F. S. Grose, Burma ; and Mr. E. Reut, Tellicherry.

CONTRIBUTIONS OF THE MUSEUM.

The Curators acknowledge a number of contributions received since the last meeting. Among the more interesting contributions mention might be made of two skins of the Mesopotamian Fallow Deer obtained by Capt. G. V. Fitzpatrick in Kurdistan. The Fallow Deer is a close relation of the European species, but he is a larger and much more brightly coloured animal, his coat resembles the bright fawn of the Indian Spotted Deer or Cheetal. The specimens obtained by Capt. Fitzpatrick were in winter coat and showed no trace of the white spots usual in the summer animal. The horns bear little resemblance to those of the Common Fallow Deer, being far less palmated and spreading and more vertical. These deer were once said to be plentiful in the jungles along the Dis and Kerhat and were also obtained on the Karun. A pair of these animals were presented to the Zoological gardens in London in 1876. Capt. Fitzpatrick also presented the Society with a Lynx and a large Jungle Cat shot in the neighbourhood of Mosul. A very fine example of the Bear Cat was sent to the Society by Mr. J. R. Hastings from Victoria Point, Tennaserim. The Bear Cat is about the size of a large Palm Civet to which he bears an affinity, his shaggy grizzled black coat, his long prehensile tail detracts however somewhat from the resemblance. It is an uncommon beast living on meat, fruit and insects and entirely nocturnal. It climbs with great agility assisted much by its long tail. It is a denizen of wild forests. Young Bear Cats are easily tamed and make delightful pets. The Bear Cat is found from Assam, through Arrakan, Tennasserim, Siam to the Malay Peninsula.

From Port Blair in the Andamans the Society received a specimen of the Andaman Civet which, though smaller, closely resembles the Himalayan Palm Civet. Two heads of Malay Sambhar and three heads of the Red Serow were presented by Mr. J. P. Mills. The Serow heads were well above

the average. Rowland Ward's Game Records gives 11½ inches as the largest, the head presented by Mr. Mills measured 10 inches.

The skin of a Golden Cat was sent by Mr. J. Hutton from Kohima, Assam. Normally the colour of the Golden Cat is a beautiful golden red, but a dark brown variety also occurs. Mr. Hutton's skin belongs to this latter class. From Mr. C. E. Milner we received the skin of an Indian Wild Dog.

A large number of skins of supposed Indian Wild Dogs were sent to the Society for identification by the Deputy Commissioner, Saugor. The skins have been sent in by people with a view to claiming the usual Government reward. An examination of the skins proved that the entire assortment were dyed skins of the Jackal. The Society recently issued a chart, prepared by Mr. S. H. Prater of the Society's staff, for the easy recognition of Wild Dogs from Jackals, Foxes, etc. The chart was issued with the object of preventing Government from being defrauded by paying out rewards on pseudo Wild Dogs, and it is hoped that officials concerned will avail themselves of the advantage the chart offers.

Seven skins of the Bengal Maccaque and two Himalayan Langurs were presented by Mr. H. Whistler in response to an appeal from the Society. Specimens of the common Red-faced Short-tailed Monkey or Bengal Maccaque were badly wanted by Mr. M. C. Hinton and the late Mr. R. C. Wroughton in connection with the proposed work on the revision of the Indian Mammalia which has been recently authorised by the Secretary of State. It is astonishing to discover that the distribution in India of so common an animal is not properly known. Any specimens forwarded to the Society will be gratefully received. While on this topic we might mention that the Society is also anxious to obtain examples of the two Adjutant Storks which occur in India:—the Large and the Lesser. The former bird was once exceedingly common round Calcutta where he did very excellent work in conjunction with the Local Sanitary Department, but he has long since given up co-operating in this respect and is now rather uncommon The Larger Adjutant is found in summer all over Northern India and is very abundant in Burma in winter. While the Smaller Adjutant is found over the greater part of India, but is no where common.

As regards birds we must first mention the acquisition of two young Hornbills; the specimens were procured for the Society through Mr. Tagarsee and D. S. Kaikini of the Forest Department in the Kanara jungles. The Society has been for a long time on the look out for a live specimen to replace the late lamented "William" who lived for 26 years in the Museum, and who now adorns the Society's Museum beautifully mounted in a glass case. The new arrivals are both females and have been named Joan and Helen, both birds are in good condition and their continuous croaking is only to be equalled by their hearty appetites. It will be interesting to watch the development of the great casque which surmounts the beak of the adult Hornbills; already the young birds show signs of this development.

A Pochard and a Gargeny Teal were presented by Major C. H. Stockley from the Karung river near Rawalpindi and another Pochard from Nowshera by Capt. C. B. Wainwright. Major Stockley also sent us a few birds' eggs. Three Bronze Winged Jaccanas, a Common Snipe, Painted Snipe and a Little Stint and a Greebe were contributed by Mr. B. C. Ellison and D. Murray.

Among the reptiles we might mention an example of the Clouded Monitor sent to us by Mr. M. M. Mackenzie from Bihar, an Anammally Viper from Mr. A. P. Kinloch from the Nelliampathy Hills and a Banded Wolf Snake from Shillong sent in by Lt.-Col. G. R. Row. A young Russel's Viper was brought in by Mr. F. Hearn from Andheri. Mr. A. E. Hefford presented us with a rather nice example of a young Saw Fish and Mr. Ollenbach contributed a small collection of Butterflies which will help to fill a number of blanks in the Society's collection.

We give below a detailed list :—

Mammals.

1. Lynx (*Cynœlurus jubatus*), Dahuk, Capt. G. V. Fitzpatrick.
1. Jungle Cat (*F. chaus*), Dahuk, Capt. G. V. Fitzpatrick.
2. Mesopotamian Fallow Deer (*Dama mesopotamica*), Dahuk, Capt. G. V. Fitzpatrick.
1 Hedge-Hog (*Hemiechinus auritus*), Sistan, Major R. F. D. MacGregor.
4 Gerbills (*Meriones hurrianæ*), Wana, Waziristan, Capt. C. M. Ingoldby.
1 Golden Cat (*F. temmincki*), Assam, J. Hutton.
1 Pine Martin (*M. flavigula*), Naga Hills, Assam, J. P. Mills.
2 Stump-tailed Maccaques (*Maccaca sp.*), Naga Hills, Assam, J. P. Mills.
7 Bengal red-faced Monkeys (*M. rhesus*), Punjab, H. Whistler.
1 Mouse Hare (*Ochotona* sp.) Punjab, H. Whistler.
2 Himalayan Langur (*P. schistaceus*), Punjab, H. Whistler.
1 Andaman Civet Cat (*P. tytleri*), Port Blair, Andaman Islands, G. Field.
2 Malay Sambhar heads (*C. u. equinus*), Naga Hills, Assam, J. P. Mills.
3 Red Serow (*C. sumatrensis rubidus*), Naga Hills, Assam, J. P. Mills.
1 Giant Squirrel (*R. gigantea*), Nepal, Major Lauri.
3 Grizzeled Giant Squirrels (*R. m. sandolena*), Darupuram, Salem Dist., M. Syed Monavoor.
1 Hare (*Lepus nigricollis*), Sangum, Poona, G. C. Amore.
1 Himalayan Palm Civet (*P. grayi*), Nepal, Lt.-Col. R. L. Kennion.
A Collection of small mammals, Darjeeling, H. Stevens.
24 Mammals, Ceylon, W. W. A. Phillips.
1 Himalayan Porcupine (*A. hodgsoni*), N. W. Himalayas, A. E. Jones.
1 White-nosed Weasel (*M. canigula*), Koti State, N. W., A. E. Jones.
Bear Cat (*A. binturong*), Victoria Point, Burma, J. R. G. Hastings.
Tree Shrew (*T. wroughtoni*) Khandalla, W. Ghats, Dr. M. Sutor.
3 Malformed Horns of Sambhar (*C. unicolor*), Saugor, C. P., Mr. Hamilton.
Indian Bandicote (*B. malabarica*), Kurla, Thana, D. Baretto.
Indian Wild Dog (*C. dukhunensis*), Burma, C. E. Milner.
Himalayan Horse Shoe Bat (*R. perniger*), Darjeeling, D. A. Mathews.
5 Striped Squirrels (*F. pennanti*), Bengal, Chas. M. Inglis.
1 Giant Squirrel (*R. gigantea*), Bengal, Chas. M. Inglis.
1 Toddy Cat (*P. niger*), Bengal, Chas. M. Inglis.

Birds.

3 Bronze-winged Jacanas (*Metopodius indicus*), Thana, B. C. Ellison.
1 Fan-tailed Snipe (*G. cœlestis*), Thana, Bombay, B. C. Ellison.
1 Painted Snipe (*R. capensis*), Thana, Bombay, B. C. Ellison.
2 Little Stints (*T. minuta*), Thana, Bombay, B. C. Ellison.
1 Indian Grebe (*P. albipennis*), Thana, Bombay, B. C. Ellison.
1 Moor-Hen (*G. chloropus*), Thana, Bombay, B. C. Ellison.
1 Sociable Lapwing (*C. gregaria*), Nowshera, F. H. Peppe.
1 Southern Tree-pie (*D. leucogaster*) Southern India, A. M. Kinloch.
1 Great Indian Hornbill (*D. bicornis*), Hanover, Karwar, Tuggerse.
1 White-eyed Duck (*N. ferruginea*), Nowshera, N. W. F., C. B. Wainright.
1 Great Indian Hornbill (*D. bicornis*), alive, Kanara, D. S. Kaikini.
1 Tufted Pochard (*N. fuligula*), Rawalpindi, C. H. Stockley.
1 Gargeney Teal (*Q. circia*), Rawalpindi, C. H. Stockley.
5 Birds Eggs, Rawalpindi, C. H. Stockley.
1 Jungle Crow (*C. macrorhynchus*) Kashmir, Mr. Livesey.
3 Adjutant Storks (*Leptophlus dubius*), Chas. M. Inglis.

Insects.

1 Box Butterflies, Dehra Dun, O. C. Ollenbach.
6 Dragonflies, Duars, H. V. O.'Donel.

Reptiles.

Spiny-tailed Lizard (*U. occelatus*), Arabia, Yamba, D. F. Fraser.
1 Annamaly Viper (*L. anamallensis*), Kollengode, S. I., A. M. Kinloch.
1 Straited Wolf Snake (*L. striatus*), Wanourie, Poona, B. Barnett.
4 Sea Snakes, Bombay Coast, A. E. Hefford.
1 Clouded Monitor (*V. nebulosus*), Bihar, M. M. Mackenzie.
1 Snake (*Trop. platyceps*), Jutogh, Capt. C. M. Ingoldby.
1 Lizard (*Gymnodactylus sp.*), Jutogh, Capt. C. M. Ingoldby.
1 Earth Snake (*T. brahminus*), Bombay, G. C. Amore.
1 Brown Tree Snake (*D. trigonata*), Seistan, Persia, Major R. F. D. MacGregor.
1 Banded Wolf Snake (*L. fasciatus*), Assam, Lt.-Col. G. R. Row.
1 Buff-striped Keel Back (*T. stolatus*), Igatpuri, Mr. Hitchcock.
1 Keelback alive (*M. plumbicolor*), Igatpuri, Mr. Hitchcock.
1 Russel's Viper (*V. russellii*), Andheri, Bombay, F. Hearn.
1 Cobra (*N. tripudians*), Multan, Civil Surgeon.

Fishes.

1 Saw Fish (*P. cuspidatus*), Bombay Harbour, Hefford.
1 Eel (*Murœnesox cinereus*) Bombay Harbour, B. C. Ellison.
12 Fish, Back Bay, Bombay, G. C. Amore.

Minor contributions from Messrs. A. P. Kinloch, C. W. Burnside, S. Basil Edwards, Major R. F. D. MacGregor, Capt. Fitzpatrick, Major A. G. Frere and Mr. J. A. Ferguson. Maj. A. G. Frere, Maj. C. H. Stockley.

Paper read.

Mr. Ellison, the Curator of the Museum, then read an interesting paper written by Mr. Prater and himself on Bird Notes and Observations in Ahmedabad. The paper will be published in a future number of the Journal. The lecture was illustrated throughout by photographs and birds taken from the Society's collection.

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AL[illegible]ECTORIS GRÆCA CHUKOR.

The Chukor Partridge.

(½ life size.)

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THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U., C.F.A.O.U.

PART XXXI.

(Continued from page 22 of this Volume.)

(With a plate.)

GENUS ALECTORIS, Kaup.

Hartert in *Novitates Zoologicæ* has dealt very fully with the genus as in India have hitherto known as *Caccabis*. In Volume XXIV. p. 275, he shows that the proper name for this genus is *Alectoris* and in the following pages he deals with the species and sub-species at length, and with his usual care and thoroughness; although unfortunately he does not give us a summary of the results of his deductions at the end in accordance with his general custom. In so far as our Indian birds are concerned, I follow this paper.

The typical form of the species *Alectoris graeca graeca* is found as its name denotes in Greece and thence various geographical forms range over practically the whole of South West Central and West Europe, Western and Central Asia to India, two races entering our limits.

In *Alectoris* the sexes are alike. They are Partridges of moderate size, and almost uniform upper plumage, but have the flanks broadly barred with black and chestnut; the tail is rounded and about equal to two-thirds the length of the wing; the latter is short and

rounded, the first primary being equal to the 5th or 6th; the tarsus is very powerful and armed with a short blunt spur in the male.

KEY TO SUB-SPECIES.

A.—Darker .. .. *Alectoris græca chukar.*
B.—Paler .. .. *Alectoris græca pallescens.*

ALECTORIS GRÆCA CHUKAR.

The Indian Chukor.

Tetrao kakelik—Falk, Beitr. zur. topogr, Kennt. Russ. Reich., III., p. 390 (1786), (Russian Turkestan).

Perdix kakelik—Lath., Gen. Syn. Suppl., II., p. 282 (1802); id., Gen. Hist., VIII., p. 290 (1823).

Perdix chukar—Gray, Ill. Ind. Zool., I., pl. 54 (1830-32), (India); Gould, Cent. Him. B., pl. 71 (1832).

Chakura pugnax—Hodgs., Madr. Jour., 1837, p. 505.

Caccabis chukar—Gray. List of Birds, pt. 3, Gall., p. 36 (1844); id., Cat. Hods. ed., I., p. 127 (1846); Adams, P. Z. S., 1858, p. 502 (W. Himalayas and Punjab); Irby, Ibis, 1861, p. 236 (Kumaon); Jerdon, B. of I., III., p. 564 (1863); Tytler, ibid, 1868, p. 203 (Mussoorie); Pelzeln, ibid. p. 321 (Koteghur); Beavan, ibid, p. 384 (Simla); Brooks, ibid. 1869, p. 60 (Almorah); Hume, Nest and Eggs, p. 589 (1873); id., Str. Feath., I., p. 226, 1873 (Sindh); Cock. and Marsh., ibid. p. 358 (Murree); Ball. ibid. III., p. 208 (1875), (Suliman Hills); Butler, Cat. B. Sind., p. 54 (1879); Hume and Marsh., Game-B. II., p. 34 (1879); Scully, Str. Feath. VIII., pp. 348, 366, 367 (1879), (Nepal); Barnes, ibid. IX., pp. 219, 458 (1880). (Chaman); Biddulph, ibid, p. 358 (Gilgit); Wardlaw-Ram., Ibis, 1880, p. 70 (Kurram Valley); Biddulph, Ibis, 1881, p. 93 (Gilgit); Scully, Str. Feath., X., p. 139 (1881). (Gilgit); Marshall. Ibis. 1884. p. 423 (Chamba); St. John, Ibis, 1899, p. 175 (Quetta); Oates' ed., Hume's Nests and Eggs, III., p. 431 (1890); Ogilvie-Grant, Cat. B. M., XXII., p. 113 (1893); id., Game-B., I., p. 91 (1895); Oates' Game-B., I., p. 179 (1898); Blanf., Avifauna, B. I., IV., p. 131 (1898); Davidson, Ibis. 1898, p. 39 (Kashmir and Sind); Marsh. J. B. N. H. S., XV., p. 353 (Quetta); Fulton, ibid. XVI., p. 61 (1904). (Chitral); Rattray, ibid, XVI., p. 663. Murree; Whitehead. Ibis. 1908. p. 269 (Kohat); id., J. B. N. H. S., XX., p. 966 (1911). (Kurram); Meinertzhagen, ibid, XXIII., p. 363 (1914), (Quetta); Whistler. Ibis. 1916. p. 99 (Jhelum); Jones, J. B. N. H. S., XXVI., p. 619 (1919), (Simla).

Alectoris græca—Meinertzhagen, Ibis, 1920, p. 186 (Quetta).

Alectoris græca chukar—Hartert. Nov. Zool., XXIV., p. 280 (1917).

Vernacular Names.—Chukar (Hind.): *Kabk.* (P.); *Kau-kau*, (Kashmir); *Chukru* (Chamba); *Zarkar* (Pushtu).

Description—Adult Male and Female.—Forehead and lines through the eye, down the neck and meeting as a gorget between the throat and upper breast, black; next the forehead pure grey, this colour running back as an indistinct supercilium, often albescent posteriorly; crown vinous red changing to ashy on hind neck and again to vinous red on back and scapulars, and then once more to ashy on lower back, rump, and upper tail coverts; ear-coverts dull chestnut; middle tail feathers ashy drab, outer feathers the same but pale chestnut on the terminal half; outer scapulars with pure pale grey centres; smaller and median coverts and innermost secondaries like the back; outer wing-coverts ashy; primaries and secondaries brown with a yellowish buff patch on the centre of the outer webs; point of chin and below gape black; lores, cheeks, chin and throat white-tinged with buff to a varying extent; below the black gorget the breast is ashy-tinged more or less with brown and vinous at the sides, the lower breast being generally a pure French grey; abdomen, vent, thighs and lower tail coverts chestnut-buff or buff; feathers of the flanks grey at the base, with two black bars divided by pale buff and with chestnut tips.

Colours of Soft Parts.—"The irides are brown, yellowish, orange, or even reddish brown; the margins of the eyelids crimson or coral to brick red; the eyelids themselves grey; the bills are crimson to deep coral red, often dusky on culmen, and generally so at base and about the nostrils; the legs and feet vary from coral pink to deep-red; claws dusky brown. In young birds the bill is brownish black and the legs and feet orange-red."

Measurements.—This bird varies most extraordinarily in size, but the very great majority of the specimens available for examination have not been sexed, and though there is no doubt that the males average bigger than the females, the extremes of size seem to be much the same in both sexes. The wing runs from 146 to 180 mm., both of these extremes being specimens from the Simla Hills, the average of 80 birds is 157 mm. Tarsus 41 to 52 mm., culmen 19 to 21 mm.; tail 78 to 105 mm.

Hume gives the weights as "male 19 to 27 ozs., females 13 to 19 ozs."

Young Birds of the year, otherwise adult in plumage, often retain some of the barred wing quills of the first plumage bird.

Young Bird in First Plumage dull brownish grey, each feather above with white tip and two black spots next it; head a little more rufescent; tail grey with mottley bars of black and white, the outer feather tinged with rufous; below dirty brownish-white with faint brown bars.

Chick in Down.—Crown pale bright rufous; above pale fulvous, with four stripes of speckled rufous and black; wings pale fulvous, mottled rufous and black; below pale fulvous, a little deeper on chest.

Distribution.—Through the Himalayas as far East as Nepal, and in the hilly portions of the Punjab. Not in Sind or in the extreme North of Kashmir and Ladak.

Nidification.—The Chukor breeds from practically the level of the plains up to 15,000 and 16,000 feet, but appears to be most common between about 4,000 and 10,000 feet. The altitude, however, alters the time of breedings considerably; in the foot-hills and lower elevations it lays in April and early May, a few eggs having been found in the end of March; in the middle ranges, say from 4,000 to 6,000 feet, it lays principally in May and early June, whilst in the highest ranges eggs have been taken well on towards the end of August. The nest is, as a rule, merely a hollow scratched in the ground, and lined with a little grass or a few leaves, sometimes, however, it makes quite a compact pad of grass, leaves and other rubbish with a well-formed depression in the centre for the eggs. Frequently it may be found in open nullahs or on rocky hill sides, merely protected from sun and rain by a rock or stone, but more often a site is selected amongst bushes, scrub, willow-bushes or ferns, which shade as well as screen it from enemies, human and otherwise. It is never, apparently, placed in very thick scrub, and certainly never in forest, but may sometimes be found in fairly long grass, especially if there are patches of rocky and bare ground close by.

A very curious exception to the above nesting sites is one described by Mr. H. Whistler in a letter to me. He writes:—

> "Two nights ago, 11th June, I was going along the Hindustan-Tibet road close to Gondla, 10,000 feet, in fact only some 200 yards from the Rest-house at the entrance to the village, when my eye suddenly caught a Chukor sitting on the head of one of the pollard willows beside the road. Investigation showed that she was sitting on a well-made nest of leaves, which contained 12 eggs. These were rather stained, and there were a good many of the bird's own feathers in the nest, signs which are quoted locally as proof that the eggs are incubated. The people here are interested in this point as they take great quantities of Chukor eggs for food. I accordingly only took two eggs in order to examine them. They proved, however, to be quite unincubated, without a trace of blood but rather congealed and I fancy the potential chicks had been destroyed by the severe cold, snow and rain which had occurred a few days ago, and which has destroyed many eggs and young birds. Next morning I found that the eggs were stone cold and the bird had evidently deserted.
>
> "The other nests I have seen here were deep hollows in the ground, well lined with bents, etc. and all were well hidden by being placed either under a stone with herbage growing in front of it, or under a briar bush or a small green plant which is very common."

A normal full clutch is 8 to 10 but as few as 5 or 6 eggs have been found incubated, whilst on the other hand 11 or 12 eggs are not rare and occasionally clutches are found much bigger still. Mr. Livesey records a nest of an allied Persian sub-species containing no less than 21 eggs.

In colour the eggs are generally a very pale yellowish or greyish stone colour, more or less freckled all over with pale reddish brown or pinkish purple; in some eggs there are no markings beyond these minute freckles, but in others there are a fair number of small irregular blotches of the same colour scattered here and there amongst the other markings, and in a few only these markings are still larger and more numerous. Some eggs have the ground colour a pale *café-au-lait*, and in some the eggs look, as described by Hume, "as if drops of white paint tinged with purple had been dropped upon them."

In shape they vary from fairly true ovals to ovato-pyriform, and the texture is close and hard and with a fair amount of gloss.

The average of 200 eggs is 43·0 × 31·7 mm. and the extremes are as follows: longest 48·2×32·1, shortest 37·6×30·4 mm.; broadest 46·1×33·1 mm.; most narrow 40·1×29·0 mm.

Habits.—The Chukor is found at practically all levels, from almost that of the plains, where these are broken and rocky and interspersed with hills and ravines, to 14,000 feet snow level and well above that to 16,000 feet or more, as the summer advances and the snow recedes. It is found in almost any kind of country other than actual forest, but where there are grass uplands it may be found in the immediate vicinity of these also. They must be amongst the most hardy and adaptive of birds, for they will stand the most extraordinary heat, such as that of the central portions of Arabia and Mesopotamia, or the bitter cold of deep snows on the higher ranges of the Himalayas. They are not, however, found in any of the more humid areas where the rainfall is prolonged over many months. Typically, they are birds of the deserts, rocky barren hills or the more moderately dry hills of the outer ranges of the Himalayas which, though well watered and wooded, have wide areas of grass land or stretches of cultivation.

According to Hume, Wilson and others, their favourite grounds seem to be grassy hillsides, with or without a certain amount of cultivation and, indifferently, whether covered with a mere scanty growth of coarse grass or fairly well covered with bushes, etc., in addition to the grass itself. In the N.-W. of its range, however, it is found in the barest and rockiest of country; great hillsides, strewn with rocks and boulders for the most part devoid of all vegetation beyond scattered tufts of withered grass, a few windbeaten and distorted bushes, and perhaps here and there in the hollows a wheat-field or some other kind of cultivation.

In the non-breeding season they collect in coveys of some size generally of a dozen or so, often as many as 30, whilst Wilson talks of

"40, 50, or even 100." In spring, of course, they separate, and then in pairs attend to their domestic duties.

At this time of the year they are very pugnacious and their loud challenges may be heard in every direction in places where they are at all numerous. Hume describes their call as follows:—

> "The tone varies, first he says 'I'm here, I'm here,' then he asks 'Who's dead? Who's dead?' and when he is informed of the untimely decease of his pet brother and favourite sister, or perhaps his eldest son and heir, he responds, 'Oh lor! Oh lor!' in quite a mournful tone."

In India he is not much used as a fighting bird in captivity except in North-west Kashmir and a few other parts, but his cousins over most of the range inhabited by them are very commonly kept for this purpose. His character for pluck and pugnacity has ranked very high from the time of the Romans, and then, as now, large sums were won and lost over the victory or defeat of a favourite bird.

They are very easy to tame, whether caught adult or reared from the egg, and soon learn to know their masters and to follow them. They are usually kept in small cages, but are daily allowed out, practically without any restraint, and allowed to wander about in search of food, much like a farm-yard fowl. In the Grecian islands, as a matter of fact, they seem to be kept just as any other domestic birds are, being driven out in flocks during the day, and then recalled in the evening by the children. They associate with the other members of the farm-yard quite amicably, although during the breeding season the cocks fight so desperately amongst themselves.

Hume thought them to be almost entirely vegetarians, eating only seeds, grains, etc., and helping their digestion with numerous small stones. Doubtless they are mainly seed-eaters, but they also eat all kinds of small insects, especially ants, as well as caterpillars, grubs and larvæ.

From a sporting point of view the Chukor ranks fairly high amongst our Indian game-birds, though he can nowhere be bagged in the vast numbers that snipe, and grouse, duck and some of our other birds are sometimes shot.

They lie fairly well, though when first disturbed, they sometimes run a considerable distance before consenting to be flushed, but after the first flight they seldom run unless the country is absolutely bare, and even then, after running a short distance, they will generally squat close until one gets within a few feet of them, when with a whirr and a rush they are off again. They fly fast and strongly and carry shot well for their size, and as the flocks after first being flushed often scatter considerably, they furnish a number of shots, and, let us hope, a satisfactory number of kills, from the same covey. Apparently the number of birds to be found in the present day is much the same as they were fifty years ago. With hard work and long

trudges one can still get 10 or 12 brace to one gun in a day's shoot, and, with luck, even 20 couple may grace the game-bag where they are most numerous.

For the table they are dry, but not ill-flavoured, and some people prefer them to the Grey and Black Partridges and even to Jungle-fowl.

Alectoris græca pallescens.

Hume's Chukor.

Caccabis pallescens—Hume and Hend., Lahore to Yark., p. 383 (1873), (Kashgar); Scully, Str. Feath. IV., p. 182 (1876).

Caccabis pallidus—Hume and Hend., Lahore to Yark., p. 284 (1873); Forsyth, P.Z.S., 1874, p. 324 (Kashgar); Scully, Str. Feath., IV., p. 183, (1876); Sharpe, 2nd Yark. Miss., Aves, p. 121, (1891).

Caccabis saxatilis chukor—Witherby, Ibis, 1903, pp. 504, 570 (S.-W. Persia); id., ibid. 1907, p. 108 (W. Persia).

Caccabis kakelik humei—Falk., Sarudny, Mess. Orn. Moskva, 5. p. 52 (1914).

Caccabis chukor—Swinhoe, Ibis, 1882, p. 119 (S. Afghanistan); Sharpe, Ibis, 1886, p. 498 (Bushire); Meinertzhagen, J. B. N. H. S. XXIII., p. 363, (1914), (Quetta). Cumming, ibid. XXVI., p. 294 (1918), (Fao).

Alectoris græca pallescens—Hartert, Nov. Zool., XXIV., p. 286 (1917).

Vernacular Names.—As in the last. *Keklik*, (Turki).

Description.—This form of Chukor differs from the last in its much paler general tint.

Distribution.—Extreme North of Kashmir, Lok, Ladak, Eastern Turkestan, Yarkand.

Nidification.—Dr. Scully records of this form:—

> "It breeds from May to June, usually at an elevation of about 6,000 feet. On the 5th June a nest of the Chukor was found at Kakin Powah; it was on the ground under the edge of a rock, and well sheltered by ferns and small bushes. The nest was a nice pad of grass and leaves, and contained 7 nearly fresh eggs, which were neatly arranged, 6 in a circle, with the small ends pointing inwards, and the 7th egg filling up the centre."

Again he writes:—

> "In the hills bounding the plains of Kashgaria on the south, at elevations of from 6,000 to over 12,000 feet, the birds were numerous near willow-bushes and streams. On the 30th August near Gulgun Shah, at an elevation of about 12,500 feet I found a nest of this species containing only 3 eggs. The nest was composed of a few leaves and fibres, placed in a slight depression in the ground, and covered over by a bush."

eggs of this form cannot be distinguished from those of the last

Scully records that this Cuckoo abounds in all the
valleys across the plains of Kashgaria to the North, West and South
[illegible]

"In the winter they seem to come down to lower elevations than
they frequent in the summer; numbers are then caught and
brought into Yarkand and Kashgar for sale.

"This species is rather prized by the Yarkandis on account
of its fighting propensities. I have seen some battles between
Cuckoos which I kept for fighting. I see nothing savage in the
birds appearing to be decidedly pugnacious."

HAND-LIST OF THE "BIRDS OF INDIA."

BY

E. C STUART BAKER, F.L.S., F.Z.S., M.B.O.U. C.F.A.O.U

PART V.

(*Continued from Page 106 of this volume.*)

Sub-order MEROPES.

Family MEROPIDÆ.

1302. (1026) **Merops orientalis orientalis.** *The Common Indian Bee-Eater.*

M. orientalis *Lath., Ind. Orn. Suppl., p. xxxiii* (1801), (*Mahratta, India*).

India, Bengal to Ceylon.

1303. (1026) **Merops orientalis birmanus.** *The Burmese Green Bee-Eater.*

Merops viridis birmanus *Neumann., Orn. Monatsber.*, 1910, *p.* 80, (*Irawaddy*).

Assam and Burma.

1304. (1026) **Merops orientalis biludschicus.** *The Sind Green Bee-Eater.*

Merops viridis biludschicus *Neumann., op. cit., p.* 80 (*Persia, Baluchistan*).

S. E. Persia to Sind and Baluchistan.

1305. (1027) **Merops superciliosus javanicus.** *The Burmese Blue-tailed Bee-Eater.*

Merops javanicus *Horsf., Trans. Linn. S.*, 1821, *p.* 171, (*Java*)

India, Ceylon and Burma to Java.

1306. (1028) **Merops persicus persicus.** *The Blue-cheeked Bee-Eater.*

Merops persica *Pall., Reis. versch. russ. Reichs., ii., p.* 70 (1773), (*Caspian Sea*).

Summer visitor to W. and N. W. India

1307. (1029) **Merops apiaster.** *The European Bee-Eater*

Linn., S. N., I. p. 117 (1758), (*Europe*)

N. and N. W. India, Kashmir, etc

1368. (1030) **Melittophagus erythrocephalus erythrocephalus.** *The Chestnut-headed Bee-Eater.*

Merops erythrocephalus *Gmel., S. N.*, i., *p.* 463 (1788), (*India*). (*Ceylon*).

Ceylon, S. India, sub-Himalayas, Burma, etc.

1369. (1031) **Nyctiornis athertoni.** *The Blue-bearded Bee-Eater.*

Merops athertoni *Jard. and Selby., Ill. Orn., ii., pl.* 58 (1829), (*India*), (*Cachar*).

Sub-Himalayas, Dehra Doon to Assam, Burma, Malabar Coast.

1370. (1032) **Nyctiornis amictus.** *The Red-bearded Bee-Eater.*

Merops amictus *Temm., Pl. Col., iv., pl.* 310 (1824), (*Bencoolen, Sumatra*).

Tenasserim southwards.

Sub-order HALCYONES.

Family ALCEDINIDÆ.

1371. (1033) **Ceryle rudis leucomelanura.** *The Indian Pied Kingfisher.*

Ceryle leucomelanura *Reichen., Handl. Alced., p.* 21 (1851), (Ceylon).

India, Burma and Ceylon.

1372. (1034) **Ceryle lugubris guttulata.** *The Himalayan Pied Kingfisher.*

Ceryle guttulata *Stegneger, Pro. U. S. N. M., xv., p.* 294 (1893), (*India*), (*Cachar*).

Assam to China and Hainan.

1373. (1035) **Alcedo atthis bengalensis.** *The Common Indian Kingfisher.*

Alcedo bengalensis *Gmel., S. N., i., p.* 450 (1788), (*Bengal*).

All India.

1374. *(1035) **Alcedo atthis pallasii.** *The Central Asian Kingfisher.*

Alcedo pallasii *Reichen., Handl. spec. In. Alced., p.* 3 (1851), (*West Siberia*).

N. and Central Asia. Punjab and Sind, Kashmir.

1375. *(1035) **Alcedo atthis taprobana.** *The Ceylon Kingfisher.*

Alcedo ispida *var.* taprobana *Kleinschm., Orn. Mber., ii. p.* 126 (1894), (*Ceylon*).

Ceylon.

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* Neither of these are very strongly marked forms.

1376. †(1036) **Alcedo cœrulescens asiatica.** *Beavan's Kingfisher.*

Alcedo asiatica *Swains., Zool. Illus.* 1*st. ser. i.*, (1821), (*some part of India*), (*Bengal*).

Bengal, Belgaum, Travancore, Ceylon.

1377. (1037) **Alcedo cœrulescens scintillans.** *The Tenasserim Kingfisher.*

Stuart Baker, *Bull., B. O. C., xxxix., p.* 38 (1919), (*Bankasoon*).
Peninsula, Burma and Siam, lat. 10° to 16°.

1378. (1037) **Alcedo cœrulescens coltarti.** *The Assam Kingfisher*

Stuart Baker, *op. cit., p.* 39, (*Saddya, Assam*).

Sikkim to Assam, N. Burma to lat. 16° ; Siam, Cochin-China.

1379. (1037) **Alcedo cœrulescens rufigastra.** *The Andaman Kingfisher.*

Alcedo rufigastra *Wald., A. M. N. H.*, (4), *xii., p.* 487 (1873), (*S. Andamans*).
Andamans.

1380. ‡(1038) **Alcedo iredalei.** *Blyth's Kingfisher.*

Stuart Baker, *Bull., B. O. C., xlii., p.* 29 (1921), (*Darjiling*).

Sikkim and lower hills N. and S. of Brahmapootra in Assam.

1381. (1039) **Alcedo euryzona.** *The Broad-zoned Kingfisher.*

Temm., Pl. Col. lin. 36 (1830), (*Java*).
Java and Borneo as far N. as Muleyit in Tenasserim

1382. (1040) **Ceyx tridactylus tridactylus.** *The Indian Three-toed Kingfisher.*

Alcedo tridactyla *Pall., Spec. Zool., VI., p.* 10 (1769), (*India*) (*Assam*).

India and Burma.

1383. (1040) **Ceyx tridactylus macrocercus.** *The Andaman Three-toed Kingfisher.*

Oberholser, *Smith. In. U. S. Nat. His. Bull.*, 98, *p.* 24 (1917)' (*Andamans*).
Andamans.

† The true *cæruleecens* is not found as far north as Bankasoon. The name *meningling* is ante-dated by Viellots, *Alcedo cærulescens* Nouv. Dict. d'Hist. Nat. ix., p. 401, 1818, Timer (? errore).

‡ *Alcedo grandis* is pre-occupied and another name had therefore to be given.

384. (1041) **Ramphalcyon amauroptera.** *Brown-winged Kingfisher.*

Halcyon amauropterus *Pearson, J. A. S. B., x., p.* 635 (1841), (*Calcutta*).

Coast localities from Bengal to Tenasserim.

385. (1042) **Ramphalcyon capensis intermedia.** *The Nicobar Stork-billed Kingfisher.*

Pelargopsis intermedia *Hume, S. F., ii., p.* 166 (1874). (*Galatea Bay, Nicobars*).

Nicobars.

386. (1043) **Ramphalcyon capensis gurial.** *Brown-headed Stork-billed Kingfisher.*

Alcedo gurial *Pearson, J.A.S.B., x.*, 1841, *p.* 633 (*Midnapore, Bengal*).

All India.

387. (1043) **Ramphalcyon capensis burmanica.** *The Burmese Stork-billed Kingfisher.*

Pelargopsis burmanica *Sharpe, P.Z.S.*, 1870, *p.* 67 (*Tonghoo, Burma*).

Burma, Siam, Cambodia, Cochin-China.

388. (1043) **Ramphalcyon capensis osmastoni.** *The Andaman Stork-billed Kingfisher.*

Stuart Baker, Bull. B. O. C.

Andamans.

389. (1044) **Halcyon smyrnensis smyrnensis.** *The White-breasted Kingfisher.*

Alcedo smyrnensis *Linn., S.N., i., p.* 116 (1758) (*Africa and Asia*).

Central and W. Asia, Baluchistan and Sind.

390. (1044) **Halcyon smyrnensis fusca.** *The Indian White-breasted Kingfisher.*

Alcedo fusca *Bodd., Tabl., Pl. Enl., p.* 54 (1783), (*Malabar*).

India, Burma, Malay Pen., Siam, S. China, etc.

391. (1044) **Halcyon smyrnensis generosa.** *The Ceylon White-breasted Kingfisher.*

Halcyon generosa *Medar., Ann. Mus. Hun., ii., p.* 85 (1904) (*Ceylon*).

Ceylon and ? (S. Travancore).

1392. (1044) **Halcyon smyrnensis saturatior.** *The Andaman White-breasted Kingfisher.*

Halcyon saturatior *Hume, S.F., ii.*, 531 (1874), (*Andamans*).
Andaman and Nicobar Islands.

1393. (1045) **Halcyon pileata.** *The Black-capped Kingfisher.*

Alcedo pileata *Bodd., Tabl. Pl. Enl., p.* 41 (1783), (*China*), (*Canton*).
Throughout India occasional, Assam, Burma, Siam, S. China.

1394. (1046) **Entomothera coramanda coramanda.** *The Indian Ruddy Kingfisher.*

Alcedo coramanda *Lath., In. Orn., ii., p.* 252 (1790), (*Coramandel Coast*).
India, Burma, Malay Pen., Siam and S. China.

1395. (1046) **Entomothera coramanda mizorhina.** *The Andaman Ruddy Kingfisher.*

Oberholser, Pro. Nat. Mus. U.S., 1915, *p.* 645 (1925), (*N. Andaman Is.*)
Andaman and Nicobars.

1396. (1047) **Sauropatis chloris chloris.** *The White-collared Kingfisher.*

Alcedo chloris *Bodd., Tab. Pl. Enl., p.* 49 (1783), (*Bouru*).
Tennasserim, Southwards.

1397 (1047) **Sauropatis chloris vidali.** *The Malabar White-collared Kingfisher.*

Halcyon vidali *Sharpe, Cat. B.M., xvii., p.* 278 (1892), (*S. Konkan*).
S. W. Coast of India.

1398. (1047) **Sauropatis chloris davisoni.** *The Andaman White-collared Kingfisher.*

Halcyon davisoni *Sharpe, op. cit., p.* 282 (*Andaman*).
Andamans.

1399. (1048) **Sauropatis chloris occipitalis.** *The Nicobar White-collared Kingfisher.*

Todiramphus occipitalis *Blyth, J.A.S.B., xv., p.* 23 (1847). (*Nicobars*).
Nicobars.

1400. (1049) **Caridagrus concretus.** *The Sumatran Kingfisher.*

Dacelo concreta *Temm. Pl. Col., p.* 346 (1825), (*Sumatra*).
Extreme South of Tenasserim to Sumatra, Borneo, etc.

1401. (1050) **Carcineutes pulchellus amabilis.** *The Pegu Banded Kingfisher.*

Carcineutes amabilis *Hume, S.F., i., p.* 474 (1873), (*Pegu Hills*).
Central and South Burma.

Sub-order BUCEROTES.

Family BUCEROTIDÆ.

1402. (1051) **Dichoceros bicornis.** *The Great Hornbill.*

Buceros bicornis *Linn., S.N., i., p.* 104 (1758), (*China*), (*Travancore*).
West Coast from Travancore N. to Bombay, Himalayas to Burma, Siam.

1403. (1052) **Anthracoceros coronatus coronatus.** *The Malabar Pied Hornbill.*

Buceros coronatus *Bodd., Tabl., Pl. Enl., p.* 53 (1783), (*Malabar*).
Ceylon, South and South-West India, North to C. P., Orissa and Lower Bengal.

1404. (1053) **Anthracoceros coronatus affinis.** *The Large Indian Pied Hornbill.*

Buceros affinis *Blyth, J.A.S.B., xviii., p.* 802 (1849), (*Deyra Doon*).
Sub-Himalayas, Dehra Dun to Assam, N. of Brahmapootra.

1405. (1053) **Anthracoceros coronatus albirostris.** *The Small Indian Pied Hornbill.*

Buceros albirostris *Shaw and Nod., Nat. Misc., xix., p.* 819 (1807), (*Chandernagore*).
Assam, S. of Brahmapootra to Tenasserim, Siam and Cochin China.

1406. (1054) **Rhytidoceros undulatus.** *The Malayan Wreathed Hornbill.*

Buceros undulatus *Shaw., Gen. Zool., viii., p.* 26 (1811), (*Java*),
Assam and Burma to Java.

1407. (1055) **Rhytidoceros subruficollis.** *Blyth's Wreathed Hornbill.*

Buceros subruficollis *Blyth, J.A.S.B., xii., p.* 177 (1843), (*Tenasserim*).
Arrakan and S. Burma, Sumatra and Borneo.

1408. (1056) **Rhytidoceros narcondami.** *The Narcondam Hornbill.*

Hume, S.F., i., p. 411 (1873), (*Narcondam*).
Narcondam, N. Andamans.

1409. (1057) **Aceros nepalensis.** *The Rufous-necked Hornbill.*

Buceros nepalensis *Hodg., As. Res., xviii., p.* 178 (1829), (*Nepal*).
Himalayas, Nepal to Assam, Central Burma to Tenasserim.

1410. (1058) **Anorhinus galeritus.** *The Bushy-crested Hornbill.*

Buceros galeritus *Temm., Pl. Col., pl.* 520 (1824), (*Sumatra*).
Tenasserim, South to Borneo.

1411. (1059) **Ptilolæmus tickelli tickelli.** *Tickell's Hornbill.*

Buceros tickelli *Blyth., J.A.S.B., xxiv., p.* 266 (1855), (*Tenasserim*).
Pegu to Tenasserim.

1412. (1060) **Ptilolæmus tickelli austeni.** *Godwin-Austen's Hornbill.*

Anorhinus austeni *Jerd., Ibis.*, 1872, *p.* 6 (*N. Cachar Hills*).
Assam, S. of Brahmapootra.

1413. (1061) **Berenicornis comatus.** *The Long-crested Hornbill.*

Buceros comatus *Raff., Trans. L.S., xiii., p.* 339 (1822), (*Sumatra*).
S. Tenasserim, southwards to Sumatra and Borneo.

1414. (1062) **Lophoceros birostris.** *The Common Grey Hornbill.*

Buceros birostris *Scop., Del. Flor. et Faun. Insub., ii., p.* 87 (1786), (*Coramandel*).
Plains of India, not N. W. or Malabar Coast.

1415. (1063) **Lophoceros griseus.** *The Malabar Grey Hornbill.*

Buceros griseus *Lath., Ind. Orn., i., p.* 147 (1790), (*Nove Hollandie-Malabar*).
W. Coast from Travancore to Bombay.

1416. (1064) **Lophoceros gingalensis.** *The Ceylonese Hornbill.*

Buceros gingalensis *Shaw, Gen. Zool., viii., p.* 37 (1811), (*Ceylon*).
Ceylon only.

1417. (1065) **Rhinoplax vigil.** *The Helmeted Hornbill.*

Buceros vigil *Forster, Ind. Zool., p.* 40 (1781) (*No loc.*), (*Tennasserim*).
Tenasserim to Sumatra and Borneo.

Sub-order UPUPÆ.

Family UPUPIDÆ.

418. (1066) **Upupa epops epops.** *The European Hoopoe.*

Upupa epops *Linn., S.N., i., p.* 117 (1758), (*Sweden*).
Straggler into N. W. India.

419. (1066) **Upupa epops saturata.** *The Tibetan Hoopoe.*

Lonnberg, *Arkiv. für Zool., v., p.* 29 (1909), (*Kiachta*).
Winter visitor to Assam, Burma, Siam and Yunnan.

420. (1067) **Upupa epops orientalis.** *The Indian Hoopoe.*

Nomen Nov. (*Umballa*).
Northern India to Sikkim.

421. (1067) **Upupa epops ceylonensis.** *The Ceylon Hoopoe.*

Upupa ceylonensis *Reich., op. cit.* (*Ceylon*).
Ceylon and South India to Bombay and Orissa.

422. (1067) **Upupa epops longirostris.** *The Burmese Hoopoe.*

Upupa longirostris *Jerd., B. of I., i., p.* 333 (1862), (*Burma*).
Assam, Burma, Siam, Cambodia, etc.

Order MACROCHIRES.

Sub-order MICROPODES.

Family MICROPODIDÆ.

Sub-family *Micropodinæ*.

423. (1068) **Micropus melba melba.** *The Alpine Swift.*

Hirundo melba *Linn., S.N., i., p.* 192 (1758), (*Gibraltar*).
India, Ceylon and Assam.

424. (1069) **Micropus apus pekinensis.** *The Eastern Swift.*

Cypselus pekinensis *Swinh., P.Z.S.*, 1870, *p.* 435 (*Peking*).
Himalayas to W. Assam.

425. (1070) **Micropus murinus murinus.** *The Pale Brown Swift.*

Cypselus murinus *Brehm., Vogelfang, p.* 46 (1855), (*Egypt*).
Egypt, Persia, Baluchistan and Sind.

426. (1071) **Micropus pacificus pacificus.** *The Large White-rumped Swift.*

Hirundo pacifica *Lath., Ind. Orn. Suppl., p. lviii.* (1801), (*Australia*).
Assam, Burma to Japan and Australia.

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* *Upupa indica* Reich., Handb. spec. Orn., p. 320, cannot be used as the species described by *Upupa indica* Latham, Ind. Orn. i, p. 280, (1790), and therefore a new name has to be given.

1427. (1071) **Micropus pacificus acuticauda.** *The Khasia Hills Swift.*

Cypselus acuticauda *Blyth, Ibis,* 1865, *p.* 45 (*Cherrapoonji, Khasia Hills*).
Khasia Hills and ?

1428. (1071) **Micropus pacificus cooki.** *The Burmese White-rumped Swift.*

Cypselus pacificus cooki *Harington, Bull. B.O.C., xxxi., p.* 56 (1912), (*N. Shan States*).
N. Shan States ; resident.

1429. (1072) **Micropus pacificus leuconyx.** *Blyth's White-rumped Swift.*

Cypselus leuconyx *Blyth, J.A.S.B., xiv., p.* 212 (1845), (*N. W. Himalayas*).
N. W. Himalayas ; resident.

1430. (1073) **Micropus affinis affinis.** *The Common Indian House-Swift.*

Cypselus affinis *Gray, Ill. Ind. Zool., pl.* 35 (1832), (*Ganges*).
Tropical India.

1431. (1073) **Micropus affinis galilegensis.** *The Kashmir House-Swift.*

Cypselus galilegensis *Antinori, Naumannia, p.* 307 (1855), (*Palestine*).
N. W. Africa, S. E. Asia to Kashmir.

1432. (1074) **Micropus affinis subfurcatus.** *The Malayan House-Swift.*

Cypselus subfurcatus *Blyth, J.A.S.B., xviii., p.* 807 (1849) (*Penang*).
Assam, Burma and Malay Pen.

1433. (1075) **Tachornis batassiensis batassiensis.** *The Palm-Swift.*

Cypselus balassiensis (*misprint*), *Gray, in Grif. An. King. vii., p.* 60 (1829), (*India*).
India and Ceylon.

1434. (1076) **Tachornis batassiensis infumatus.** *The Eastern Palm-Swift.*

Cypselus infumatus *Sclater, P.Z.S.,* 1865, p. 602 (*Borneo*).
Assam, Burma, E. to China, S. to Java, etc.

Sub-family CHÆTURINÆ.

***1435.** (1077) **Hirundinapus caudacuta nudipes.** *The White-necked Spine-tail.*

Chætura nudipes *Hodg., J.A.S.B., v., p.* 779 (1836), (*Nepal*).
Himalayas, Hazara to Assam.

* *Chaturae* is the generic name for an American species quite different to our Indian forms. *Hirundinapus* must therefore be used for the big forms whilst our two small ones which are both quite different generically from the large birds must be called *Indicapus* Mathews, and *Rhapidura*, Oates.

1436. (1078) **Hirundinapus gigantea indica.** *The Brown-necked Spine-tail.*

Chætura indica *Hume, S.F., i., p.* 471 (1873), (*Aneichardi, Travancore*).

Ceylon to Assam, Burma, Andamans.

1437. **Hirundinapus cochinchinensis.** *The Cochin China Spine-tail.*

Oustalet, Bull. Soc. Phil., 1878, *p.* 52 (*Saigon, Cochin China*).

Assam, Burma, Siam, Cochin China.

†1438. (1079) **Idicapus sylvatica.** *The White-rumped Spine-tail.*

Acanthyiis sylvatica *Tickell, J.A.S.B., xv., p.* 284 (1846), *Central India.*

Eastern India from the Himalayas to the extreme South and West only as far North as the Bombay Pres.

†1439. (1080) **Rhapidura leucopygialis.** *The Grey-rumped Black Spine-tail.*

Acanthylis leucopygialis *Blyth, J.A.S.B., xviii., p.* 809 (1849), (*Penang*).

Tenasserim, South through the Malay Pen.

1440. *(1081) **Collocalia unicolor unicolor.** *The Indian Edible Swiftlet.*

Hirundo unicolor *Jerd., Madr. Jour. L.S.,* 1840, *p.* 238 (*Coonoor Pass*).

Ceylon, S. W. India and W. Himalayas.

1441. (1082) **Collocalia fusciphaga brevirostris.** *The Himalayan Swiftlet.*

Hirundo brevirostris *McClell., P.Z.S.,* 1839, *p.* 155 (Assam)

Himalayas, from Simla to Assam and Manipur.

1442. (1083) **Collocalia innominata.** *Hume's Swiftlet.*

Hume, S.F., i., p. 294 (1873), (*Port Mouatt, S. Andamans*)

S. Andamans, Tenasserim, Siam, Malay Pen.

1443. (1084) **Collocalia francica francica.** *The Little Grey-rumped Swiftlet.*

Hirundo francica *Gmel., S.N., i., p.* 1017 (1789), (*Mauritius*).

Is. of Mauritius and Bourbon and ? Ceylon.

1444. **Collocalia francica inexpectata.** *The Andaman Grey-rumped Swiftlet.*

Collocalia inexpectata *Hume., S.F., i., p.* 296 (1873), (*Button Is. Andamans*).

S. Andamans, Nicobars, S. Malay Pen., Tenasserim.

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† Vide footnote at the bottom of page 321.

* For revision of this genus see Oberholser, Pro. Nat. Mus., U. S. A., Vol. 42. p. ii., id. Acad. Nat. Scie. Philadelphia, 1906, p. 177 ; Stresemann, Nov. Zool., 1912 p. 347.

1445. **Collocalia francica germaini.** *Oustalet's Grey-rumped Swiftlet.*

Collocalia germani *Oust., Bull. Soc. Philom. Paris, p.* 1 (1876), (*Condore Is.*).
Mergui Archipelago. Tenasserim and S. Siam, Cochin China and Philippines.

1446. (1085) **Collocalia linchi affinis.** *Beavan's Swiftlet.*

Collocalia affinis *Beavan, Ibis,* 1867, *p.* 318, (*Port Blair*).
Andamans and Nicobar Is.

1447. **Collocalia linchi elachyptera.** *Oberholser's Swiftlet.*

Oberholser, Pro. Acad. Nat. Sci. Phil., U.S.A., 1906, *p.* 207 (*Bentinck Is.*)
Islands of Mergui Pen.

Sub-Family HEMIPROCNINÆ.

1448. (1086) **Hemiprocne coronata.** *The Indian Crested Swift.*

Hirundo coronata *Tick., J.A.S.B., ii., p.* 580 (1833), (*Bora, bhum*).
Ceylon, India, Burma and Siam.

1449. (1087) **Hemiprocne longipennis.** *The Malayan Crested Swift.*

Hirundo longipennis *Rafin., Bull. Soc. Phil. Paris, iii., p.* 153 (1803), (*Java*).
Malay Pen. Tenasserim to Borneo, Java and Sumatra.

1450. (1088) **Hemiprocne comata.** *The Tufted Tree Swift.*

Cypselus comatus *Temm., Pl. Col.,* 268 (1824), (*Sumatra*).
Tenasserim, Malay Pen. to Celebes.

Sub-Order CAPRIMULGI.

Family CAPRIMULGIDÆ.

1451. (1089) **Caprimulgus mahrattensis.** *Sykes' Nightjar.*

Sykes, P.Z.S., 1832, *p.* 83, (*Mahrattas*).
Sind, N. W. Provinces, Afghanistan and Baluchistan. Straggler East to Bengal.

1452. (1090) **Caprimulgus monticolus.** *Franklin's Nightjar.*

Franklin, P.Z.S., 1831, p. 116 (*Calcutta-Benares*).
India from Mysore to Himalayas, Burma, Siam and Cochin China.

1453. (1090) **Caprimulgus asiaticus.** *The Common Indian Nightjar.*

Lath., Ind. Orn. ii., p. 588 (1790), (*India*), (*Bombay*).
India and Ceylon and Burma S. to Moulmein.

1454. (1092) **Caprimulgus europæus nuwini.** *Hume's Nightjar.*

Caprimulgus unwini *Hume, Ibis.*, 1871, *p.* 406 (*Hazara*).
Transcaspia to Baluchistan, Sind, Kashmir and N. W. India.

1455. (1093) **Caprimulgus macrurus bimaculatus.** *The Burmese Long-tailed Nightjar.*

Caprimulgus bimaculatus *Peale, U.S. Expl. Exp.* 8, *p.* 170, (1848), (*Malacca*).
Malay Pen. to Burma, (and ? Assam), Siam, Yunnan and S. W. China.

1456. **Caprimulgus macrurus albononotus.** *The Indian Long-tailed Nightjar.*

Caprimulgus albononotus *Tick., J.A.S.B., ii., p.* 580 (1833) (*Dolbhum, Bengal*).
N. W. Provinces to Bengal.

1457. *(1093) **Caprimulgus macrurus nipalensis.** *The Nepal Long-tailed Nightjar.*

Caprimulgus nipalensis *Hartert,Cat. B.M., xvi., p.* 541 (1892) (*Nepal*).
Nepal to N. Assam and Hills of S. Assam.

1458. (1093) **Caprimulgus atripennis.** *Jerdon's Long-tailed Nightjar.*

Jerdon, Ill. Ind. Orn., pl. 24 (1847), (*Eastern Ghats, S. India*).
Ceylon and S. India, N. to Godaveri and Belgaum.

1459. (1094) **Caprimulgus andamanicus.** *The Andaman Nightjar.*

Hume, S.F., i., p. 470 (1873), (*Andamans*).
Andaman Is. only.

1460. (1095) **Caprimulgus indicus indicus.** *The Jungle Nightjar.*

Caprimulgus indicus *Lath., Ind.Orn., ii., p.* 588 (1790), (*India*).
Practically all India S. of Himalayas.

1461. (1095) **Caprimulgus indicus jotaka.** *The Himalayan Jungle Nightjar.*

Caprimulgus jotaka *Temm. and Schl., Faun. Jap., p.* 37 (1847), (*Japan*).
Siberia to Japan, Himalayas E. to Assam, N.Burma and Siam.

†1462. (4095) **Caprimulgus kelaarti.** *The Ceylon Jungle Nightjar*

Caprimulgus kelaarti *Blyth, J.A.S.B., p.* 175 (1851), (*Ceylon*).
Ceylon, possibly extreme S. Travancore.

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* See Oberholser, Pro. Nat. Mus. 48, p. 587 (1915), *C. atripennis* is a separate species and not a race of *macrurus*.

†The position of this bird is doubtful. It is *not* a race of *indicus* but is possibly a Southern form of *atripennis*.

1463. (1096) **Lyncornis cerviniceps cerviniceps.** *Gould's Great-eared Nightjar.*

Lyncornis cerviniceps *Gould, Icon. Av., ii., pl.* 14 (1838), (*China*).
N. Malay Pen., Burma, Siam, Assam.

1464. (1096) **Lyncornis cerviniceps bourdilloni.** *Bourdillon's Great-eared Nightjar.*

Lyncornis bourdilloni *Hume, S.F., iii., p.* 302 (1875), (*S. Travancore*).
Travancore.

Sub-order PODARGI.

Family PODARGIDAE.

1465. (1097) **Batrachostomus hodgsoni.** *Hodgson's Frogmouth.*

Otothrix hodgsoni *Gray, P.Z.S.*, 1859, *p.* 101 (*Darjiling*).
Sikkim to Assam, Manipur to Karennee.

1466. (1098) **Batrachostomus affinis.** *Blyth's Frogmouth.*

Blyth, J.A.S.B., xvi., p. 1180 (1847), (*Malacca*).
Tenasserim to Borneo.

1467. (1099) **Batrachostomus moniliger.** *The Ceylonese Frogmouth.*

(*Layard*), *Blyth., J.A.S.B., xviii., p.* 806 (1849), (*Ceylon*).
Ceylon and Travancore.

Order TROGONES.

Family TROGONIDÆ.

1468. (1100) **Pyrotrogon fasciatus.** *The Malabar Trogon.*

Trogon fasciatus *Pennant, In. Zool., pl. iv.* (1769), (*Ceylon*).
Chota Nagpur to the Godaveri, S. W. India and Ceylon.

1469. (1101) **Pyrotrogon erythrocephalus erythrocephalus.** *The Red-headed Trogon.*

Trogon erythrocephalus *Gould, P.Z.S.*, 1834, *p.* 25 (*Rangoon*).
Nepal E. to Assam, Burma, Siam and ? Malay Pen.

1470. (1102) **Pyrotrogon duvaucelî.** *The Red-rumped Trogon.*

Trogon duvauceli *Temm., Pl. Col., No.* 291 (1824), (*Sumatra*)
Tenasserim, Pen. Siam to Borneo.

1471. (1103) **Pyrotrogon oreskias uniformis.** *Robinson's Yellow-breasted Trogon.*

Robinson, Jour., F.M.S., vii., p. 149 (1917), (*Trang., Pen. Siam*).
Arrakan, Siam. Cochin China and S. to Malay Pen.

Order COCCYGES.

Family Cuculidæ.

Sub-Family *Cuculinæ*.

1472. (1104) **Cuculus canorus telephonus.** *The Asiatic Cuckoo.*

Cuculus telephonus *Heine, Jour. f. Orn.*, 1863, *p.* 352 (*Japan*).
N. Asia, E. to Japan, S. to Himalayas and S. China. Migrant to Ceylon.

1473. (1104) **Cuculus canorus bakeri.** *The Khasia Hills Cuckoo.*

Hartert, Vog. Pal., vii., p. 948, (1912), (*Shillong, Khasia Hills*).
Hills S. of Brahmapootra, Manipur, Chin Hills to Shan States.

1474. (1105) **Cuculus optatus.** *The Himalayan Cuckoo.*

Gould, P.Z.S., 1845, *p.* 18 (*Port Essington, Australia*).
N. Asia, Central Asia to Himalayas.

1475. (1106) **Cuculus poliocephalus poliocephalus.** *The Small Cuckoo.*

Cuculus poliocephalus *Lath., In. Orn., p.* 214 (1790), (*India*), (*Srinagar*).
N. E. Asia, N. and C. China to Himalayas. Casual Ceylon.

1476. (1107) **Cuculus micropterus micropterus.** *The Indian Cuckoo.*

Cuculus micropterus *Gould, P.Z.S.*, 1837, p. 137 (*Himalaya*).
Breeding S. and Central China, Central Asia and India. Casual Ceylon.

1477. (1108) **Hierococcyx sparveroides.** *The Large Hawk-Cuckoo.*

Cuculus sparveroides *Vigors, P.Z.S.*, 1832, *p.* 173 (*Central Himalayas*).
N. India and Burma, Yunnan, China, etc.

1478. (1109) **Hierococcyx varius.** *The Common Hawk-Cuckoo.*

Cuculus varius *Vahl., Skriv. Nat. Selsk., iv., p.* 61 (1709), (*India*).
India and Ceylon, not Assam, Punjab or Sind.

1479. **Hierococcyx fugax fugax.** *The Javan Hawk-Cuckoo.*

Cuculus fugax *Horsf., Trans. L.S., xiii., p.* 178 (1821), (*Java*).
A rare straggler into Burma.

1480. (1110) **Hierococcyx fugax nisicolor.** *Hodgson's Hawk-Cuckoo.*

Cuculus nisicolor *Blyth, J.A.S.B., xii., p.* 943 (1843), (*Nepal*).
Himalayas, Nepal to Assam, Burma and Siam.

1481. (1111) **Hierococcyx nanus.** *The Small Hawk-Cuckoo.*

Hume, S.F., v., p. 490 (1877), (*S. Tenasserim*).
S. Tenasserim, Salangor and N. Borneo.

1482. (1118) **Cacomantis merulinus querulus.** *The Rufous-bellied Cuckoo.*

Cacomantis querulus *Heine, Jour., f. Orn.*, 1863, *p.* 352 (*Nepal Burma*).
E. Bengal, N. and S. Assam, Burma and S. China.

1483. (1112) **Cacomantis merulinus passerinus.** *The Indian Plaintive Cuckoo.*

Cuculus passerinus *Vahl., Skriv., Nat. Selsk., iv., p.* 57 (1797), (*India*).
India and Ceylon, excluding previous area and Rajputana.

1484. (1114) **Penthoceryx sonneratii sonneratii.** *The Banded Bay Cuckoo.*

Cuculus sonneratii, *Lath., Ind. Orn., i., p.* 215 (1790), (*India*), (*N. Cachar Hills*).
India, Burma and Siam.

1485. (1114) **Penthoceryx sonneratii waiti.** *The Ceylon Banded Bay Cuckoo.*

Stuart Baker, Bull. B.O.C., xxxix., p. 46 (1918), (*Ceylon*).
Ceylon only.

1486. (1114) **Penthoceryx sonneratii venustus.** *The Malay Banded Bay Cuckoo.*

Cuculus venustus *Jerd., Madr. Jour. L.S., xiii., p.* 140 (1842), (*Malacca*).
S. Tenasserim and Siam, Malay Pen. to Borneo and Java.

1487. (1115) **Chalcococcyx xanthorhynchus xanthorhynchus.** *The Violet Cuckoo.*

Cuculus xanthorynchus *Horsf., Trans. L.S., xiii., p.* 179 (1821), (*Java*).
Assam to N. and Central Burma.

1488. (1115) **Chalcococcyx xanthorhynchus malayanus.** *The Malay Violet Cuckoo.*

Cuculus malayanus *Raff., Trans. L. S., xiii., p.* 286 (1822), (*Malay Pen*).
Pen. Siam and Burma, Andamans, etc., Malay Pen. to Borneo.

1489. (1116) **Chalcococcyx maculatus.** *The Emerald Cuckoo.*

Trogon maculatus *Gmel., S.N., i., p.* 404 (1788), (*Ceylon*).
Himalayas, Simla to Assam, Burma, Siam, etc., to Sumatra.

*1490. (1117) **Surniculus lugubris brachyurus.** *The Malay Drongo Cuckoo.*

Stresemann, Nov. Zool., xx., p. 340 (1913), (*Pahang*).
Pen. Burma and Siam, S. through Malay Pen.

1491. (1117) **Surniculus lugubris dicruroides.** *The Indian Drongo Cuckoo.*

Pseudornis dicruroides *Hodg., J.A.S.B., viii., p.* 136 (1839), (*Nepal*).
Upper India, Assam, Burma, Siam, Hainan, China.

1492. (1117) **Surniculus lugubris stewarti.** *The Ceylon Drongo Cuckoo.*

Stuart Baker, Nov. Zool., xxvi., p. 293 (1919), (*Ceylon*).
Ceylon, Travancore and W. Coast to Karwar.

†1493. (1118) **Clamator jacobinus.** *The Pied Crested Cuckoo.*

Cuculus jacobinus *Bodd., Tabl. Pl. Enlum., p.* 53 (1783), (*Coromandel Coast*).
Ceylon, India ; W., N. and Central Burma.

1494. (1119) **Clamator coramandus.** *The Red-winged Crested Cuckoo.*

Cuculus coramandus *Linn., S.N., i.,p.* 171, (1766) (*Coromandel Coast*).
Ceylon, India East, Burma.

Sub-Family PHŒNICOPHAINÆ.

1495. (1120) **Eudynamis scolopaceus scolopaceus.** *The Indian Koel.*

Cuculus scolopaceus. *Linn., S.N., i., p.* 111 (1758), (*Bengal*).
India and Ceylon.

1496. (1120) **Eudynamis scolopaceus malayana.** *The Malay Koel.*

Eudynamis malayana *Cab. and Hein., Mus. Hein., iv., p.* 52 (1862), (*Sumatra*).
Siam and Burma, Assam, Malay Pen.

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* See Stuart Baker, Nov. Zool., xxvi., p. 293, and Stresemann, ibid, xxiii., p. 335.

† The name *Clamator* antedates *Coccystes*, see Stegneger, Pro. Biol. Soc. Wash., xv., p. 87.

1497. (1121) **Zanclostomus javanicus.** *The Lesser Red-billed Malkoha.*

Phœnicophäes javanicus *Horsf., Trans. L.S.*, 1822, *p.* 178 (*Java*).
Pen. Siam and Burma, Malay Pen. to Borneo, etc.

1498. (1122) **Rhopodytes viridirostris.** *The Small Green Malkoha.*

Zanclostomus viridirostris *Jerd., Madr. Jour. L.S., xi., p.* 223 (1840), (*Coonoor*).
Ceylon and S. India, N. to Belgaum and the Godaveri.

1499. (1123) **Rhopodytes tristis tristis.** *The Large Green-billed Malkoha.*

Melias tristis *Less., Traité d'Orn., p.* 132 (1831), (*Bengal*).
Lower Himalayas, Kumaon to Bengal and Assam, N. and South.

1500. (1123) **Rhopodytes tristis longicaudatus.** *The Large Malay Green Malkoha.*

Phœnicophæus longicaudatus *Blyth., J.A.S.B., x., p.* 923 (1841), (*Moulmein*).
Burma, Siam, Cambodia and Malay Pen.

1501. (1124) **Rhopodytes diardi.** *Diard's Green-billed Malkoha.*

Melias diardi *Less., Traité d'Orn., p.* 132, 1831 (*Sumatra*).
Tenasserim and Malay Pen. to Sumatra.

1502. (1125) **Rhopodytes sumatranus.** *The Sumatran Green-billed Malkoha.*

Cuculus sumatranus *Raff., Trans. L.S., xiii., p.* 287 (1822), (*Sumatra*).
Tenasserim S. to Sumatra.

1503. (1126) **Phœnicophaes pyrrhocephalus.** *The Red-faced Malkoha.*

Cuculus pyrrhocephalus *Pennant, Ind. Zool., p.* 66 (1769), (*Ceylon*).
Ceylon only.

1504. (1127) **Ramphococcyx erythrognathus.** *The Chestnut-breasted Malkoha.*

Phœnicophäes erythrognathus *Hartl., Verz. Mus. Brom., p.* 95 (1844), (*Sumatra*).
S. Tenasserim to Sumatra.

1505. (1128) **Rhinortha chlorophæa chlorophæa.** *Raffles' Green-billed Malkoha.*

Cuculus chlorophæus *Raff., Tran. L.S., xiii., p.*288 (1822), (*Sumatra*).
S. Tenasserim to Sumatra, *not* Borneo.

1506. (1129) **Taccocua sirkee sirkee.** *The Punjab Sirkeer Cuckoo.*

Centropus sirkee *Gray, Hard. Ill. Ind. Zool., i., pl.* 28 (1830-32), (*Nilgiris*).
Upper India, Punjab to Behar and W. Bengal.

1507. (1129) **Taccocua sirkee infuscata.** *The Hill Sirkeer Cuckoo.*

Taccocua infuscata *Blyth., J.A.S.B., xiv., p.* 201 (1845), (*Sub-Himalayas*).
Foot-hills of Himalayas, N. of last race.

1508. (1129) **Taccocua sirkee leschenaulti.** *The Southern Sirkeer Cuckoo.*

Taccocua leschenaulti *Less., Traité d'Orn., p.* 144, (1830), (*India*), (*Kanara, Bombay*).
South India and Ceylon.

1509. (1130) **Centropus sinensis sinensis.** *The Chinese Crow-Pheasant.*

Polophilus sinensis *Stephen, Shaw's Gen. Zool., ix., p.* 51 (1815), (*Ningpo, China*).
Himalayas and Sub-Himalayas, from Kashmir to N. Assam and S. China.

1510. (1130) **Centropus sinensis intermedius.** *Hume's Crow-Pheasant.*

Centrococcyx intermedius *Hume, S.F., i., p.* 454 (1873), (*Thayetmyo*).
S. Assam, Manipur, Burma, Siam to N. Malay Pen.

1511. (1130) **Centropus sinensis parroti.** *The Southern Crow-Pheasant.*

Stresemann, *Nov. Zool., xx., p.* 323 (1913), (*Ceylon*).
Ceylon and India, N. to the Ganges and Bombay, etc.

1512. (1131) **Centropus chlororhynchus.** *The Ceylon Crow-Pheasant.*

Blyth, J.A.S.B., xviii., p. 805, (1849), (*Ceylon*).
Ceylon only.

1513. (1132) **Centropus andamanensis.** *The Andaman Crow-Pheasant.*

Tytler, Beavan, Ibis, 1867, p. 321 (*Andamans*).
Andaman Is. and Cocos.

1514. (1133) **Centropus bengalensis bengalensis.** *The Indian Lesser Crow-Pheasant.*

Cuculus bengalensis *Gmel., S.N., i., p.* 412, (1788) (*Bengal*).
Ceylon S., C., W. and N. E. India, N. Chin and Kachin Hills, N. Siam.

1515. (1134) **Centropus bengalensis javanensis.** *The Malay Lesser Crow-Pheasant.*

Cuculus javanensis *Dumont, Dic. Sc. Nat., xi., p.* 144 (1818) (*Java*).
Pen. Siam and Burma to Java.

Order PSITTACI.

Family Psittacidæ.

*1516. (1134) **Psittacula eupatria eupatria.** *The Large Ceylonese Paroquet.*

Psittacus eupatria *Linn., Syst. Nat., i., p.* 140 (1766), (*Ceylon*).
Ceylon and Travancore, Mysore and Malabar.

1517. (1135) **Psittacula eupatria nipalensis.** *The Large Indian Paroquet.*

Palæornis nipalensis *Hodg., As. Res., xix., p.* 177 (1836), (*Nepal*).
N. and C. India, from Punjab to Bengal and Sunderbans.

1518. (1136) **Psittacula eupatria indoburmanica.** *The Large Assam Paroquet.*

Palæornis indoburmanicus *Hume, S.F., vii., p.* 459 (1878), (*Sikkim*).
Sikkim Himalayas, Assam, Chin Hills and W. Burma.

1519. **Psittacula eupatria avensis.** *The Large Eastern Burmese Paroquet.*

Palæornis eupatria avensis *Kloss, Jour. Siam Nat. His. Soc., ii., p.* 219 (1917), (*Bhamo*).
Eastern Burma.

1520. (1137) **Psittacula eupatria magnirostris.** *The Large Andaman Paroquet.*

Palæornis magnirostris *Ball, J.A.S.B., xli.*, 2, *p.* 278 (1873), (*Andamans*).
Andaman and Cocos Islands.

1521. (1138) **Psittacula torquata.** *The Rose-ringed Paroquet.*

Psittacus torquatus *Bodd., Tab. Pl. Enl., p.* 32 (1783), (*Behar*).

1522. (1139) **Psittacula cyanocephala cyanocephala.** *The Western Blossom-headed Paroquet.*

Psittacus cyanocephalus *Linn., S.N., I., p.* 141 (1766), (*India*).
India and Ceylon E. to Sikkim.

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* *Palæornis* not being available for this genus, *Psittacula*, (Cuvier 1800) must be used in its place.

*1523. (1140) **Psittacula cyanocephala bengalensis.** *The Eastern Blossom-headed Paroquet.*

Psittacus bengalensis *Forster., Ind. Zool..p.*40 (1781), (*Bengal*).
Himalayas from Sikkim and E. Bengal to Assam and Burma, Siam and W. China.

1524. (1141) **Psittacula schisticeps schisticeps.** *The Slaty-headed Paroquet.*

Palæornis schisticeps *Hodg., As. Res., xix., p.* 178 (1836), (*Nepal*).
Himalayas to Assam N. of Brahmapootra.

1525. (1142) **Psittacula schisticeps finschi.** *The Burmese Slaty-headed Paroquet.*

Palæornis finschi *Hume, S.F., ii., p.* 509 (1874), (*Kollidoo*).
Assam S. of Brahmapootra, through Burma to Pegu and Tenasserim.

1526. (1143) **Psittacula columboides.** *The Blue-winged Paroquet.*

Palæornis columboides *Vigors, Zool. Jour., v., p.* 274 (1835), (*No locality*), (*Aneichardi Travancore*).

From S. Travancore to Khandala.

1527. (1144) **Psittacula calthropæ.** *Layard's Paroquet.*

Palæornis calthropæ *Layard, J.A.S.B., xviii., p.* 800 (1849), (*Ceylon*).
Ceylon only.

1528. (1145) **Psittacula alexandri fasciata.** *The Indian Red-breasted Paroquet.*

Psittacus fasciatus *Müll., Natur. Syst. Suppl., p.* 74 (1776), (*Pondicherry*).
Himalayas, Kumaon to Assam, Burma to Cochin China and S. China.

1529. (1146) **Psittacula caniceps.** *Blyth's Nicobar Paroquet.*

Palæornis caniceps *Blyth, J.A.S.B., xv., p.* 23, (1846), (*Nicobars*).
Nicobars Is. only.

1530. (1147) **Psittacula erythrogenys erythrogenys.** *The Nicobar Red-cheeked Paroquet.*

Palæornis erythrogenys *Blyth., J.A.S.B., xv., p.* 23 (1846), (*Nicobars*).
Nicobars only.

1531. (1148) **Psittacula erythrogenys tytleri.** *The Andaman Red-cheeked Paroquet.*

Palæornis tytleri *Hume, P.A.S.B., p.*108 (1874), (Andamans).
Andaman, Cocos, Preparis Islands.

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* *Psittacus rosa* Bodd. Tabi. Pl. Enlum., p. 53 (1783 is antedated by Forster as above 1781.

1532. (1149) **Psittinus incertus malaccensis.** *The Little Malay Parrot.*

Psittacus malaccensis *Lath., In. Orn., i., p.* 130 (1790), (*Malacca*).

Penin. Burma and Siam South to Malacca.

*1533. (1150) **Coryllis vernalis.** *The Indian Loriquet.*

Psittacus vernalis *Sparrm., Mus. Carls., No.* 29 (1787), (*No loc*), (*Carhar*).

South and W. India to Bombay, East Bengal, Sikkim, Assam to Burma.

1534. (1151) **Coryllis indicus.** *The Ceylon Loriquet.*

Psittacus indicus *Gmel., S.N., i., p.* 349 (1788), (*Ceylon*).

Ceylon and South Travancore.

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* *Loriculus* is ante-dated by *Loricula.* The next name is *Coryllis.*

(To be continued.)

GAME ANIMALS OF KASHMIR AND ADJACENT HILL PROVINCES.

BY

COL. A. E. WARD.

(*Continued from page 49 of this volume,*)

PART II.

(*With 2 plates and two text Figures.*)

Having dealt with the Kashmir Deer, it is proposed to take up the animals which do not shed their horns, and have a core inside the "horny sheath."

These are :—

The Yak, Sheep, Goats, Goat Antelope, Blue Bull, Antelopes and Gazelles They are the great attraction to the sportsmen who visit Kashmir.

* No. 341—THE YAK (*Bos gruniens*).

The "Dong" of Thibet.

Index No.	Length.	Girth.	Sportsman's Name, Locality, etc.
(1)	31″	14″	Gogra, Ladak.
(2)	30″	14″	J. Y. Allan—Pangkong, Ladak.
(3)	29″	14″	J. Y. Allan—Pangkong, Ladak.

The protective mantle of religion now prevents the shooting of the sacred Yak in His Highness' dominions, Permission to cross the Frontier is also withheld—hence the sportsman must try and obtain leave to shoot to the eastward if bent on having a specimen for his collection. After all, is it worthwhile to spend hard earned leave on the off chance ?

The skin of a freshly killed bull is a great weight, and as transport is hard to get in the remote hills, it will generally have to be abandoned after taking off the tuft of hair on the tail.

Horns of Yak from other Hill Provinces.

Index No.	Length.	Girth.	Sportsman's Name, Locality, etc.
1	35¼″	15″	E. I. Phelps (measured by Rowland Ward.)
2	32″	15″	Niti.
3	31″	14½″	A march beyond the Niti Pass.
4	31″	15″	Measured in Simla.
5	31″	15″	Do. do.

* The numbers are those of Blandford's Mammalia F.B. I. series.

Horns of 39″ in length were, it is understood, measured in Almorah Kumaon—these must be taken as very exceptional.

With modern rifles, it is easy enough to knock out a yak. In former times a solid bullet of pure lead from a ·500 express driven by 5½ drams of powder was proved to be sufficient.

The story of one or two stalks may be of interest. The month was June with a blazing sun on the stalker's back ; the elevation over 17,000 ft.; the locality, the northern side of the Chang-lung Burma pass. A cold wind had set downwards, so the approach was of necessity from below.

The stony ground was very much broken up, but for this there would have been no chance of success. After crawling upwards and peering over a rock, the herd of seven were found to be about 100 yards away. They had moved downwards and were almost on the same level. As a few minutes would have taken them to a lower level and given them the wind, the shot had to be taken at once. How it happened, cannot be told, as the herd had bunched up but the first bullet wounded a cow, the next shot did for a bull.

There remained the cow which went slowly after the herd, and the toil of following was perhaps a just retribution. The shooting was erratic, the wretched cow took five or six bullets before it finally fell, and all the use it represents is a chowry made from the tail. A sixteen hand bull is a heavy beast to turn over when being skinned, evening was coming on, the tents were far away, hence on the following day a return had to be made. After all this work the skin had to be abandoned for want of transport.

The country on the far side of the Chang-lung Burma is sterile. Formerly the route to Yarkand was over this pass, it is marked out by the bones of dead transport animals. Now the Yarkand route passes over the Khardong and Sasseer passes, thence across the Shyok to the Karakoram.

Near the Kepsang-la there were, and may be now, a few Yak. In a valley several were seen grazing under some snow. The stalk appeared to be very easy, the approach was made but a stone was displaced by a Tartar which rolled down the hill. The Yak grouped together, stared upwards and then fled,and as it was any odds against killing one they went on their way unmolested.

High up the Gogra ravine during mid-summer a few yaks come to graze. Whether the Frontier is beyond or whether Ladak includes the ridges above Gogra is uncertain. Anyhow the horns could not be brought into Leh,

It was up the Gogra that a small herd of two bulls and a few cows were met with and stalked to within about 40 or 50 yards. From thence they were watched, the bulls looking huge with long hair down almost to the ground. One passed within a few yards, stopped, snorted and then lumbered off. The wind had betrayed the supposed danger, but there was in reality none, for both bulls could have been easily killed. There was no looking back, the yak fled up the opposite hill without halting and were gone after affording a most interesting sight extending over several minutes.

SHEEP.

No. 343. Great Tibetan Sheep (*Ovis ammon hodgsoni*).

Hodgson's sheep: The Tibetan Argali: the "Ammon" of Sportsmen—called "Nyan" in Ladak. The *Ovis ammon ammon* of Siberia the largest of all sheep is the typical race of this species. In the typical race the horns turn outwards not upwards at the tips, and are thus unlike the Tibetan race (*Ovis ammon hodgsoni*.)

* Mr. J. H. Millar secured a head of a Siberian Argali with 60″ horns and a girth of 20¼″. This head is figured in Plate I.

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* The record Siberian head measures 62¼″.
The record Tibetan head measures 57″.
(Rowland Ward's "Records of Big Game" 6th Edition.)

Horns of The Great Tibetan or Hodgson's Sheep (Ovis ammon hodgsoni).

Index No.	Length.	Girth.	Tip to Tip.	Sportsman's Name, Locality, etc.
1	50½″	19″	..	Brought to the Residency in Leh. 1884, see plate of No. 1 attached.
2	50½″	15″	24″	R. St. G. Edge, 1921.
3	49″	..	..	Mrs. MacCulloch, 1921.
4	47½″	17½″	13½″	Brooke Smith, 1905.
5	47¼″	15¾″	24″	K. C. Lorzelsky, 1905.
6	47″	17½″	18″	Col. Brazier Creagh, 1905.
7	47″	18″	27″	Col. Appleton, R.E., 1905,
8	47″	17″	21″	Major Wall, 1907.
9	46¾″	17″	15″¾	Capt. S. B. Patterson, 1905.
10	46½″	..	..	Capt. Charlesworth, 1920.
11	45½″	17⅔″	18″	Major C. P. Radclyffe, 1903.
12	45½″	18″	..	Capt. E. P. Shewell, 1914.
13	45″	15¾″	20½″	P. F. Hadow, 1903.
14	45″	..	..	Capt. C. MacIver-Ritchie, 1906.
15	45″	16½″	20½″	Capt. W. B. Benton, 1904.

Ewes have horns of about 15″ to 20″ in length.

The illustration reprodruced on page 336 is from a tracing of a head shot by the late Capt. J. Y. Allan. This ram fell into a small chasm, the head was put into position and the carcase left out during the night when it froze stiff.

Memory recalls many stalks after Hodgson's Sheep, and diaries kept at the time prevent errors creeping into their narration.

In the country to the eastward of the Changchemno plenty of sheep and antelope were to be found during the early summer months. A yak with a driver, two strong Kashmiri coolies and a dog comprised the whole following. High up the hill side a solitary ram was seen to be walking slowly towards the top of a spur which was broad, nearly flat and open. Would he cross or work his way upwards and was he travelling to some distant place to feed, or was he frightened by the small caravan? When once on the move, Hodgson's Sheep will, after galloping a short distance, settle down into a steady walk and travel far.

After meandering about on the flat ridge the ram crossed and was out of sight.

A fairly easy climb took the stalker across the plateau, but only to find that the sheep had turned upwards towards a small glacier in the next ravine. This entailed a long walk up the slope on which the approach had begun.

At last under the glacier the shot was fired at the animal standing directly facing the rifle. It is hard to judge distances, it is still harder to know what to aim at when the quarry is head on and down hill. The bullet broke a foreleg. How that ram travelled on three legs was wonderful. Luckily there was no chance of his going upwards, at any rate at first, there was also no chance of his stopping for some time. A return to the starting place was all that could be done for that day. There was no scrub for a fire and very little water, a move was made up the ravine until darkness came on.

The next morning there was little climbing to be done, the flat top of the spur was crossed and the glacier reached. The track was down the middle of an open valley. Eventually the main valley was reached. By the river there were rocks and detached stones, and amongst these the ram was lying. Evidently he dared not cross the water and having tired himself out, took to the first shelter that could be found. He was shot where he rested. One of the forelegs had been splintered above the knee. A nice head of 41 inches but with both tips damaged.

Far away from the beaten tracks, to the north-eastward of the Pangkong Lake, after crossing the passes the rivers flow south-east and the border is passed. Picture to yourself, the most sterile valley you have ever seen, a hot sun, and the glare of the white borax. Joining this main valley there are many ravines some of which hold trickling streams near which various kinds of struggling plants try to grow. To graze on what can be here and there picked up Hodgson's Sheep migrates from his winter resorts.

Fairly high up amongst the ravines some rams were seen but how to get at them was the difficulty for the wind was blowing upwards. The only plan was to spend the day in the glaring main valley and take what shelter was possible behind the few rocks which lay detached from the hill sides.

As evening approached the wind, as is usually the case, changed ; there was moonlight and a move was made up the next ravine in which the sheep had been seen.

Covered with fur rugs and lying by one of the small streams, the night was passed and hopes entertained that the game had not left the grazing ground. In the early morning before a start could be made, the rams showed on the top of the ridge which lay between where they had been grazing on the previous day and

the bivouack. If they came into the ravine below, they would get the wind, as the morning was not yet sufficiently advanced for the change of the current to set upwards. Apparently only a portion of the flock had topped the edge for they lingered about and at times one or two went back on the side from which they came.

The temperature was very low on the shady side of the ravine, very different from the mid-day heat in the main valley below. The sides of the small stream showed thin ice.

The sheep stayed until the sun shone on the spur but after a short while they cleared off returning from whence they had come.

If the stalk was to be made by moving to the ridge where the rams were last seen and they had moved upwards, there was no chance of success; if they had gone downwards, there was a fair chance but probably the ravine was open ground and stalking even from above impossible.

Luck was kind, the place where the rams had last been seen was reached and by dint of crawling across the ridge towards a small indentation, cover was found. This cutting made by the melting snow was painfully narrow, and was lined with rough stones. The cover afforded by the sides of the small ravine could only be of use for a few hundred yards as it merged into shale, after which the open hill slope would be reached.

When near the end of this ravine or cutting a halt was made, by crawling slowly upwards for a few yards on the shale, the main hill slope could be seen.

Standing on this slope the white neck of a ram showed up very plainly. Here and there were others all evidently alarmed, doubtless the descent of only a few yards in the shale had made a noise and the game was on the alert. The nearest ram was looking upwards, suspecting danger from above. There was no time to be lost. It is not easy to be speedy on a slope which will not give a foothold, but somehow the top was reached. The ram turned and stared long enough to give a very easy shot to which he dropped stone dead.

The rest of the herd ran wildly downwards. One fell evidently hit far back in the spine. He stayed crumpled up for a second or two, and then rolled over and over down hill and was found in the valley below in the evening.

The stalk had taken 10 hours, so the camp was sent for, a two-day halt ordered, during which the rams were weighed and measured and the skins, etc., cleaned.

The horns of the first ram shot were 39″ only, but were absolutely perfect in shape; the second was larger, but badly broken, an old heavy animal, whole dimensions of which will be given in the Natural History notes.

What a lucky stalk! To arrive within shot of the game that had not been seen since the previous day was luck indeed! After this stalk, the country was searched for a big head with unbroken points, but not a single one could be found, which could be guessed at over 40″ to 42″, so they were left in peace.

A fine old ram with a broken leg was met with on almost flat ground. He had evidently had a bad time, and ought to have been tired of life, so he was shot.

Shortly after firing, a few Tartars appeared on the scene. By means of an interpreter, it was ascertained they came from Rudok, they expressed an earnest wish that a return to within Kashmir boundaries should be made. This was promised. The Tartars gorged on the emaciated ram's flesh, and peace reigned. That Transfontier trip was over, not a bad thing, for every one was tired and there was a longing for the green hill sides of the "Happy Vale."

No. 344.—The Great Pamir Sheep (*Ovis ammon poli*).

The *Ovis poli* has its habitat far from the hunting ground of the sportsmen who visit Kashmir and is found only in the adjacent "Hill Provinces."

Large horns are now hard to obtain. When this sheep was first brought to notice, very long but as a rule damaged horns used to be brought down for sale.

The Fauna of British India, p. 496, records horns 75″ long and 16.75″ in girth.

Horns of the Great Pamir Sheep of distant dates.

Index No.	Length.	Girth.	Tip to Tip.	Sportsman'sName,Locality, etc.
1	73½″	15″		Brought through Kashmir.
2	73″	16″		
3	73″	14″		
4	67″	14″		
5	66″	14″		

Horns of comparatively recent date.

1	63″	14⅜″	32¼″	Col. G. Sullivan.
2	59″	15¼″	40″	Shot by Martyn Kennard measured by Rowland Ward.

THE SHARPU OR OORIAL (*Ovis vignei vignei*).

As the Sharpu, Urial, etc., are only local names for the same species, and their distribution extends from Tibet to Sind, Baluchistan, etc., it is evident that the conditions of sport must greatly vary. The range of the typical race *O. v. vignei* extends from Astor to Laskar, Ladak, and probably Tibet.

Index No.	Length.	Girth.	Tip to Tip.	Name of Sportsman.	Date.	Remarks.
1	36¼	11¾	..	Mr. A. O. Hume's Collection	1881	....
2	36	10½	13	F. W. Hodgkins, Esq. ..	1906	Gilgit.
3	35¾	10¾	10½	Sir E. Lacon	1905	Ladak.
4	35½	11½	13½	Captain S. B. Patterson..	1905	,,
5	35	12¼	10½	Lt.-Col. Goring	1906	,,
6	34	11¾	..	Picked up by A. E. Ward	..	..

BHARAL (*P. nahura*)
Shot in Ladak by Maj. C. H. Stockley.

OORIAL (*O. vignei*)
Shot in Ladak by Maj. C. H. Stockley.
(Photos contributed by Maj. C. H. Stockley.)

Index No.	Length.	Girth.	Tip to Tip.	Name of Sportsman,	Date.	Remarks,
7	33½	11	..	P. F. Hadow, Esq. ..	1904	Ladak.
8	33¼	..	not given.	Captain Carey	1900	Gilgit.
9	33	..	do.	Captain Pearson ..	1903	,,
10	33	11	do.	J. I. Darcey, Esq. ..	1905	Ladak.
11	33	..	do.	H. F. Burke, Esq. ..	1909	,,
12	33	11¾	do.	A. E. Ward	1893	,,
13	32½	9¼	9¾	C. Hughes Gibb, Esq. ..	1909	Baltistan.
14	32	12	..	N. C. Cockburn, Esq ..	1905	Ladak.
15	32	10½	11	F. W. Hodgkins, Esq. ..	1909	Gilgit.
16	32	10½	6½	Major Hutchinson ..	1917	Ladak.
17	32	11	11	Captain Charlesworth ..	1920	,,
18	32	11	..	Not known	1903	Measured on roadside.
19	31¾	10¼	10½	F. S. Irwin, Esq. ..	1904	....
20	31¾	10	..	Lt. C. Seymour	1904	....
21	31½	..	..	Captain C. A. Smith ..	1903	Gilgit.
22	31½	10½	13	Captain L. D. Goff ..	1907	Ladak.
23	31½	9½	12	J.W.E. Woodhouse, Esq.	1907	Baltistan.
24	31½	9¾	9½	H. De B. Grant, Esq. ..	1909	,,
25	31½	11	..	J. A. Brooke, Esq. ..	1909	,,
26	31½	10½	15	F. W. Hodgkins, Esq. ..	1909	Gilgit.
27	31½	10¾	16	E. W. Z. Farwell, Esq...	1912	Ladak.
28	31½	10½	11½	J. F. Barington, Esq. ..	1912	Baltistan.
29	31	11	16	E. W. Botithe, Esq. ..	1912	Ladak.
30	31	10	12½	Capt. Thomson Glover..	1920	,,
31	30½	10½	16½	Captain L. T. Goff ..	1907	,,
32	30½	11	12	Captain Newton ..	1911	,,
33	30½	..	..	R. V. C. Bodley, Esq. ..	1913	Baltistan.
34	30½	10	13	Capt. Thomson Glover..	1920	Ladak.
35	30¼	11	11	G. S. Cooper, Esq. ..	1907	,,
36	30	11	18	Major H. R. Wigram ..	1904	Baltistan.
37	30	..	..	Major Napier	1908	Astor.
38	30	11½	26	Major F. J. Craske ..	1910	Baltistan.
39	30	10½	15	Captain Torkington ..	1911	Ladak.
40	30	..	..	Capt. Hony. C. Douglas	1914	Astor.

One difference of habit between the Great Tibetan Sheep and the Sharpu is that the latter, although often found in open and almost flat ground, is a better climber than the "Great sheep." Hence although Sharpu may be first found in easy places, they may move slowly away to the cliffs, for the spirit of wandering appears to guide them and they do not mind moving over the hill ranges during the hot hours of the day nearly so much as is the case with many of the game animals.

In the "Sportsman's Guide to Kashmir and Ladak" a long dreary stalk after Sharpu is described. In that stalk the game was particularly restless, but at other times a very easy approach can often be made.

Starting on a clear evening from a camp in a ravine opposite to Nanga Parbat some Sharpu were seen on the hill side. The object of the walk was not to shoot any animal, but to get opposite to the glorious glaciers and view them by moonlight. Care was taken not to cause any alarm as the ascent was continued. At night the scene was magnificent, the towering sheets of ice standing out in the moonlight from the dark valleys beneath. Cold and dreary it might be considered by some, but the huge mass of the ice covered mountain, and the vastness of the view were entrancing. Cold it certainly was, and the journey back in the darker parts of the ravines was not easy, but the spell and call of the mountain was irresistible. So a second time camp was left on the following evening, and

this time fur rugs and a pillow were taken, also food and a rifle. A slightly different route was followed in order to avoid any chance of disturbing the valley where the Sharpu had been seen.

The moonlight afforded the same glorious sight, a very curious effect was due to the moon shining on a bare hill side which gave the appearance of being snow clad, also by a valley full of white lilies.

Early the next morning the Sharpu were looked for and found within a mile or less from where they were first sighted; probably they had taken up their summer quarters in the vicinity and might have stayed for long, had it not been for the wandering Britisher who loved mountain tops, and the deep valleys beneath.

The early morning wind was blowing downwards but with the rise of the sun it changed, by mid-day the sense of smell so strongly possessed by sheep did not help them. Within about a hundred yards a flock of rams were grazing, and the one selected was easily shot. Some hours before dark the camp was reached and the followers were soon busy cooking the meat, probably if they thought at all they wondered what the next freak of their employer might be and devoutly hoped it would not entail sleeping out at high altitudes for the purpose of gazing at the cold ice.

Small Sharpu rams with the ewes are to be seen on the adjacent hills but without leaving the tracks, which serve as roads, big heads are hard to get.

In the Natural History notes, reference will be made to "Brooke's Sheep," suffice it to here say it has been proved to be a hybrid, not a distinct species, for the Sharpu and the Great Tibetan Sheep do occasionally cross.

No. 346.—The Bharal (*Pseudois nahura*).

Bharal Head. Length of Horns 29″.

The Narpu—Nah or Sna of Ladak.

The Blue Sheep, as the Bharal or Burhel is often called, has a wide distribution.

Whether or not this animal is more closely allied to the goats or to the sheep can be left for future discussion as the sport it affords is what has now to be dealt with.

Index No.	Length.	Girth.	Tip to Tip.	Name of Sportsman.	Date.	Remarks.
1	30	11	24	Major B. L. Carew ..	1905	....
2	29½	12	25	F. E. P. Butler	1912	....
3	29½	..	Not given.	Major Lawrie	1920	....
4	29½	..	„	G. W. Walker	1920	....
5	29½	11¾	Tip broken.	Capt. Davidson ..	1921	....
6	29¼	12	16	W. L. Farwell	1912	....
7	29¼	10½	10¾	Major H. R. Wigram ..	1904	....
8	29⅛	11¾	19⅛	Capt. Somerville ..	1911	....
9	29	..	Not given.	Major Gregson	1921	....
10	29	11½	..	Capt. J. G. Allan ..	1903	Below Sasser Pass.
11	29	11½	..	A. E. Ward	..	Ladak.

The list of horns is a short one for big heads seem to be hard to get; as mentioned in the "Tourist and Sportsman's Guide," the biggest trophies do not appear to come from the hills adjacent to Kashmir. In Kashmir proper there are no Burhel, in Ladak they appear to be still plentiful, but they are not nearly so much in evidence as the Sharpu. To see Burhel the high elevations have to be visited; at 17,000 ft. on the Sasser pass leading to the Karakorum, where No. 10 on the list of horns was shot. The Blue Sheep is rarely seen lower than 12,000 ft. in the summer but during the winter, where there is convenient ground, it may possibly come as low as 10,000 ft. As a rule the skins of wild sheep are not very interesting, but the skins of Burhel Rams are exceptional, and an excellent carriage rug can be made from the spring and late autumn coats of the rams.

In summer the black chest of the ram stands out clearly and it can be seen at a considerable distance, affording at the same time information as to whether a stalk should be undertaken or not. Whilst lying down the Burhel are hard to discover as they take their mid-day rest amongst loose stones. If they do not move, they can be easily overlooked, for a Ladak mountain is a huge tract of ground to examine minutely.

In Ladak not very far from the route leading to Changchenmo numbers of Burhel were once reported to have been seen. It was a wild dreary part of the hills, simply a mass of ill-defined stony mountains. The Burhel had been seen by a yak driver who had gone to fetch in his animals. As there was no hurry to move onwards, the main camp remained at Tankse whilst a visit was made to the hills where the Ladaki said there were "more Burhel than in a big flock of sheep."

A long dreary march, then a rest for the night and what seemed to be an endless tramp during the next morning found us at the top of a hill. From the summit the country was carefully searched, but to no purpose. Some distance off was another hill, bare but covered here and there with a few loose rocks, amongst which were many Burhel, all resting in a large depression or cup into which the rocks had rolled.

It was impossible to make out which were the big rams, all that could be done was to get as close as possible and then wait until the flock moved. By the time a halt was made, and a good point of observation reached, some of the sheep were standing up. Apparently they were not suspicious, for after a time they found suitable spots for another rest, under the shade of some rocks. Nothing worth shooting was to be seen, distinctly all that could be done was to wait. The day was still and the sun scorching; apparently the sheep would rest until it was cooler, and then move out of the depression, but this might not be for hours. Patience is all very well, but the position was

scarcely bearable and after what seemed to be hours a nearer approach was tried to a place where whatever direction the game moved it must be possible to get some sort of a shot. Crawling over stones is painful work, and cannot be done without some noise ; the Burhel were all standing up, males, females and half grown lambs,—a poor lot on the whole. A blanket thickly folded was pushed on to a stone and used as a rest for the rifle. The best animal which was the furthest away, fell to the shot, and then the whole flock seemed to be utterly confused, for when too far to shoot at they all stood and looked back. Then they separated and a small number turned and ran along the side of the depression, nearly all were rams, one was missed, but the left barrel brought down a better ram than the first one which was lying dead. Both heads were good ones, but amongst what appeared to be a hundred animals there was no pair of horns worth putting into the list attached. The expedition was worth taking although it lasted for four days, for it did not waste valuable time as the passes into Changchenmo were still very difficult.

On the way back to Tankse by a circuitous route a small herd of good rams were seen, and out of them a 29″ pair of horns was killed. This was luck ; the three pairs of horns could be left behind and would not have to be packed before each march. What a bore the horns are before starting on a march ! The wretched things will not fit into their places in the loads. As long as there is room between a pair of trunks or rice bags all goes well but where this is not practicable the trophies are very apt to get damaged.

Wolves, and the Ounce or Snow Leopard take heavy toll amongst Burhel, but this hardy sheep still survives in considerable numbers, probably because it is impervious to the cold and is not tempted to come into the lower ground.

The custom of putting the horns of game on stone cairns is common in Ladak. These often mark the top of a low pass or are placed in some spot to which a legend is attached. Most of these collections contain more Sharpu than Burhel horns, one reason being that fewer of the latter are shot by the villagers, another, that Burhel horns are hard and, in the absence of iron implements, they are used as hoes in rough cultivation. Sharpu horns are also thus utilised, but not to the same extent.

(To be continued.)

Some new forms of Lepidoptera from Mesopotamia and N.W. Persia.

SOME NEW FORMS OF LEPIDOPTERA FROM MESOPOTAMIA AND N. W. PERSIA.

Explanation of Plate.

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The original for the Plate is by Mr. A. Terzi.

THE BUITERFLIES OF MESOPOTAMIA.

By H. D. Peile, F.E.S.

Part II.

(*continued from page 70 of this volume*).

(With a Plate.)

PIERIDAE.

Key.

A. Ground colour white—
  a. Underside h.w. no green markings.
    a^1. U. h.w. veins not black bordered.
      a^2. apex of forewing black above .. ..*Pieris brassicæ.*
      b^2. apex of forewing plain above .. ..*Pieris rapæ.*
      c^2. f. w. above, apical, markings slight; spot between veins 6 & 7; discal spot nearer termen .. .. ..*Pieris napi, pseudorapæ.*
      d^2. Apex f. w. very pointed. U. h. w. yellow; size small .. ..*Pieris ergane.*
    b^1. U. h.w. veins broadly bordered with black.*Belenois mesentina.*
  b. Underside h.w. markings green.
    a^1. U. h.w. green edging to terminal portion of veins clavate.. .. .. ..*Pontia daplidice.*
    b^1. Underside h. w. with vein closing cell white or yellow, bordered with green..*Pontia glauconome.*
    c^1. Underside h.w. green edgings to terminal portion of veins straight not clavate.*Pontia chloridice.*
    d^1. U. h.w. white areas in form of spots not bands .. ..*Euchlœ ausonia.*
    e^1. U. h.w. white and green transverse bands.*Euchlœ belemia.*
    f^1. Underside h.w. uniform green except few minute white spots .. .. ..*Euchlœ transcaspica.*
    g^1. A brown ringed silver spot in centre of h.w. beneath: cilia pink; black terminal band on h.w. .. ..*Colias croceus* ♀ *f. pallida.*
    h^1. U. h.w. a green and yellow 4 branched patch occupying base and centre. Up f.w. apex grey usually enclosing an orange patch .. .. ..*Zegris eupheme.*

B. Ground colour yellow—
  a. Scalloped margin to wings, small orange spot in centre of each wing .. ..*Gonepteryx farinosa.*
  b. Brown ringed silver spot in centre of h.w. cilia pink. (f. d. helice has cream grd. col. varying in shade) .. .. ..*Colias crocea.*

C. Ground colour Salmon pink .. .. ..*Colotis fausta.*

Genus BELENOIS, Hb. (Anaphæis, Hb.)

B. mesentina, Cr. Seitz. I.21d & e. F. B. I. (Bingham.) Vol. II, p. 156.

Key: Colour white and black above. H. w. beneath, veins broadly bordered with black.

Several specimens were taken at Kizil Robat through November, in early December 1918 and at end of January 1919; and one at Khanikin, October 22nd, 1918, the black on the veins on the underside being well marked. One female was taken having cream ground-colour.

Food-plant—capers (*Capparis spinosa*).

It ranges from East Africa, through Arabia, Persia and India.

Larva (description abridged from Chaumette) grass-green; dorsal line dark green; lateral line very broad, plum coloured; a white spot on either side of dorsal line and a yellow spot on lateral line on each segment. Legs green hairy, head shiny black and green; segments black and hairy.

Localities:—Mesopotamia—Kizil Robat; Khanikin; and range as above mentioned. A female was taken at Kermanshah, N. W. Persia, on August 24th.

Of 9 ♂, 8 ♀ from Kizil Robat, Khanikin, Jebel Hamrin (Dyala), Fathah, and Kermanshah, Capt. Riley notes:—"All agree very well with the male described by LeCerf (Ann. d'Histoire Nat. 1913), but I do not consider they can be separated as a race. Only the wet form is represented. Specimens from Syria and Palestine are very similar, and also from Quetta, Kandahar, Baghdad, &c."

GENUS PIERIS, Sch.

P. rapæ, L. Sub-sp. **iranica,** LeCerf. Annales d'Histoire Naturelle 1913.

The "small cabbage white" is abundant along the banks of the rivers and in gardens generally in Mesopotamia. There are probably several broods in the year. Females were seen ovipositing on the upperside of the leaves of low growing plants in the third week of June at Baiji, and in November at Baghdad.

Of 73 ♂, 52 ♀ from Mesopotamia (Amara, Baghdad, Fathah, Jebel Hamrin, Khanikin, Kirkuk, & Kizil Robat.) and N. W. Persia (Harir, Karind and Kermanshah). 33 ♂, 31 ♀ of these are now in the British Museum collection.

Capt. Riley notes:—"A fine series, from every month in the year except August. The January-March forms are very different from the summer forms—May to November—and most nearly approach British Spring *rapæ*. Those from the transitional periods April and December compare well with the British summer form whilst the summer form in Mesopotamia and Persia are very different looking insects. The large bright yellow-green area at the base of the forewing below and the delicate brightness (contrasted with the rougher, greyer, winter forms) are very characteristic of it. The winter form has the forewing costa below broadly and evenly ochreous from base to the apical patch. Intermediate forms shew this breaking and gradually disappearing to the replaced by the basal green area mentioned above."

P. napi pseudorapæ, Verity.

15 ♂, 3 ♀ from Harir, 5,300 ft. and Karind Gorge, 16th July, 19th August 1918.

Two pairs taken in copula.

All except 2 ♂ now incorporated in B. M. collection.

Note by Capt. Riley:—"This is undoubtedly the form which LeCerf quotes Verity as calling the 2nd generation of *P. napi pseudorapæ*: '2nd generation' is a trifle misleading: what is meant is that this is the summer form. Unfortunately Col. Peile did not obtain the winter and intermediate forms, which resemble more the English forms."

P. ergane, Hubn, Seitz. Vol. 1, 20d.

Karind Gorge, 1 ♀, 13th August 1918: 3 ♂, 1 ♀, 19th September 1918.

Not previously recorded from any part of Persia, though taken in Upper Mesopotamia and Western Kurdistan.

Genus PONTIA, Dab.

P. daplidice, L., Seitz. Vol. I. 21 f.

Of 88 ♂ and 50 ♂ examined (49 ♂, 39 ♀ of these are now in B. M.) Capt. Riley notes:—"Captures cover every month of the year except December, and shew very well the gradual transition from the small dark winter form, through the larger brighter spring and early summer forms, to the small and very pale midsummer forms and back again. The end of June and July show the 'driest' forms; in these the hindwing underside in the male is sometimes almost devoid of markings. January and February shew the darkest undersides, November closely approaching them."

The "Bath White" is here very common, and in June and July an extreme "dry" small stunted form occurs; the ordinary or "wet" form being then still found in the adjoining Persian hills where the climate is much cooler and more moist.

In Mesopotamia there appear to be at least four, probably more, broods in the year.

The *first* from about January 24th into February, is well marked with dark green beneath. The *second* from about 29th March into April, has the green, though still well marked, slightly less so and lighter in shade. This form is larger and more plentiful than the first. The *third* appears in May and continues into June and July, and is a stunted form with dense black markings above and very pale beneath in the male, the slight markings there being more yellow than green. The females though not so pale beneath have much yellow with the green, the veins often appearing yellow.

From August to October there may be another brood. The last brood appears about 2nd November, being common in mid November, and is well marked with green beneath.

On March 28th two small green cylindrical larvæ with lateral and dorsal blue bands and a yellow band between, and minutely dotted with black, the dots being more distinct than in the larvæ of *E. belemia*, were found on a yellow-flowered crucifer, and continued to feed on the seed-pods. One was accidentally injured but the other pupated head up on the upper side of the stem of the food-plant on 31st March about noon. This pupa was banded dorsally and laterally with bluish green and pale yellowish green in between these bands. There were two prominent points on each side and a very prominent median dorsal thoracic projection, so that it was rather *Pieris* like in shape. The whole of the body, thorax and head were spotted with black, the wing-cases being green. From this pupa a male *daplidice* emerged at 8-30 a.m. on 8th April. The markings of the forewings had been visible for a day previous to emergence.

At times this butterfly is very active and much on the move, but not so constantly on the wing as *E. belemia*. Although very active, while the sun is high, it is easily caught about sunset when about to settle for the night. Eggs were seen deposited on two kinds of yellow crucifer, and were laid both on young flower-buds and on leaves.

Localities:—Mesopotamia—Sheik Said and Amara, fairly common in gardens in April and May. Kizil Robat, on the Dyala, about old canal banks and gardens most of the year. Baiji near Fathah 1920, none observed until June when it became very common about lucerne and along the bank of the Tigris.

N. Persia: Harir, 5,300 ft., elevation and widespread in Europe, N. Africa, Asia Minor and on the North West Frontier of India.

P. glauconome, Klug. r. **iranica,** Bienert, Seitz. 1·20 f.

Upperside very similar to *P. daplidice*. Underside: veins conspicuously lined with yellow, and green markings proportionately less than in *daplidice*.

May be very easily passed over unrecognized owing to its close resemblance to the more common *daplidice*. especially as the green on the underside varies greatly in amount and in shade with the seasons. As with *daplidice* there are wet and dry season forms.

Wet season form,	25th January 1919,	Mirjana (Kizil Robat).
Dry ,, ,,	8th June 1919	,, ,,
,, ,, ,,	20th November 1918	,, ,,

It ranges across the desert belt from N. and W Africa to Syria, Arabia, Persia and the Punjab. Larva described by Bingham as greenish yellow with 2 longitudinal yellow bands and 5 transverse lines of minute black dots on each segment; head yellowish green with black dots.

P. **chloridice,** Hb., Seitz., Vol. 1., Pl. 20 f.

Very similar to the common *daplidice* and easily mistaken for it: differs as stated in the Key.

Localities :—Mesopotamia—Khanikin, 22nd October 1918, one ♀ example.

The range of *chloridice* is given as S. Russia, Turkey and Chitral.

GENUS EUCHLOE Hb.

E. **ausonia,** Hb. (till lately known as *belia*, L.). Subsp. **persica,** Verity, Seitz, Vol. 1, 22b.

Above white with black apical markings and black middle spot to forewing. Hindwing beneath silvery white with regular yellowish green markings, which are arranged as spots and not stripes as in *belemia*. The underside recalls *cardamines*, the English "Orange-tip."

7 ♂, 7 ♀ (now in B. M.) and 8 others; taken 19-30th March 1920.

Referring to these, Capt. Riley remarks :—

"Verity says of his type: 'La tache apicale, peu étendue, mais très noire et à limites très nettes, rapelle plutôt celle de *belemia*, tandis que le trait discoidal très reduit, très droit et aussi éloigné de la côte que chez *falloui*, a un aspect qu'on ne retrouve chez aucun autre *Euchloë*; ce trait a la même ampleur sur les deux surfaces'.

This exactly fits the specimens collected by Lt.-Col. Peile, but its application by Verity to the specimens from Schahrud in the B. M. which he figures at plate 67, figures 31 and 32, seems unjustifiable in view of this additional material. The two features on which he lays stress are, the sharp definition of the inner edge of the apical marking, and the reduction of the discoidal spot; in the Schahrud specimens the former is very broad and diffuse, the latter large and almost quadrate in the both sexes. This race from N. E. Persia may well be called *verityi*, ssp. nov. the types being the ♂ and ♀ in the B. M. figured by Verity (l. c.); and *persica*, Verity restricted to the race from W. Persia, Kurdistan, &c."

The egg when fresh is pearl white, but soon changes to orange and later to grey just before hatching. Eggs from the abdomen of female, and others laid on food-plant are in shape a long oval, with flattened base when attached to the plant. The egg resembles that of *E. belemia*, but its longitudinal ridges, about 20 in number, appear under the microscope rather stouter and more prominent than in *belemia*. There are delicate fine transverse ridges which in certain lights are seen to pass over the longitudinal ones. The egg is laid either on a sepal or on a hair of a sepal of a young unopened flower-bud. Females of *E. ausonia* were observed ovipositing on the following crucifers which have been identified at Kew :—

1. *Brassiea tournefortii*, Gouan.

   About three feet high having small pale yellow flowers at the ends of long thin succulent stems, the leaves being mostly at the base of the

plant. On this plant the eggs were laid singly upon the sepals of a young unopened flower-bud, or upon the thin succulent stem of a flower-bud.

2. *Sinapis arvensis*, L., a race (charlock).
   About six inches high, when growing on ridges of gypsum rock, with bright yellow flowers, short stem and very hairy leaves; an egg being laid on the tip of an unopened flower-bud, another on a hair on a sepal of a young flower-bud.

On April 9th (1920) several orange coloured, eggs, probably of *ausonia*, were found on several plants of the first mentioned species, placed singly, most being on the sepals of unopened flower-buds, but two on the stem of flower-heads.

On April 11th some of the eggs darkened, and on the 12th the empty uneaten shells of three were found still on the buds, the minute golden yellow hairy larvæ being near them on flower-buds. On 15th April these larvæ were still yellow and markedly hairy with a dark particle at the tip of each hair.

Just after hatching the larvæ fed on the flower-bud. On 19th April one larva on the food plant cast its skin, and after this measured five-eighths of an inch long. Head large, pale green minutely dotted with black, all legs green. A white lateral line with spiracles in it, and with bluish mauve upper edge; above this yellowish green and dorsally mauve.

22nd April, the five larvæ on the plant are alike; length $1\frac{3}{8}$ inches, deep green with a conspicuous white lateral or spiracular line with rather narrower purple upper margin, above this deep green, then dorsally purple; legs green; head purple, rather paler in front. Four of these larvæ pupated, three head upwards and one head downwards. They all became pale brown with dark brown long beak like process, a lateral white streak on each side and dark dorsal streaks. They all became stiff and hard and failed to reach the imago stage. Possibly small black ants, which destroyed other larvæ and were a great nuisance there, may have bitten these larvæ shortly before they pupated.

Both these larvæ and pupæ resembled those of *E. belemia* reared the previous year. The only apparent difference from those of *belemia* being a rather broader and more conspicuous white lateral line.

It is curious that although females were seen ovipositing and these larvæ and pupæ were reared from the eggs, no examples of *ausonia* were seen about to correspond with this brood. No opportunity occurred of ascertaining whether any were about on the Jebel Hamrin of this, which should have been the dry season brood, the first brood having been taken in company with the Wet season brood of *E. belemia*, of which also as previously noted the dry season brood was noticeably absent at Baiji (in 1920).

E. ausonia was in March 1920 more common than *E. belemia* on the Jebel Hamrin at Fathah gorge. On the other hand at Kizil Robat the previous year when both broods of *E. belemia* were very common no *ausonia* were seen at all. *ausonia* is very active, though its flight seems more fluttering and less direct than that of *belemia*. *ausonia* averaged slightly larger than the same brood of *belemia*. The two forms are found together and may easily be mistaken the one for the other, and both vary much with the seasons; but the distinct bands of green and white beneath distinguish *belemia*. *ausonia*, like *belemia* was attracted by the smell of sulphuretted hydrogen from some oil-drums.

Localities.—Mesopotamia fairly common on the Jebel Hamrin and on the right bank of the Tigris at Fathah.

E. belemia, Esp. Seitz. Vol. 1.22a.

KEY: Colour white and black above; alternating green and white bands across hindwing beneath.

Of 98 specimens examined (23 ♂, 16 ♀, Spring form: 18 ♂, 19 ♀, Summer form: and 4 ♂, 1 ♀ ? Third brood), Capt. Riley remarks:—

"Specimens of the first generation (f. *belemia*,) and those of the 2nd generation (*palestinensis*) are very distinct although, as can be seen from the dates above, they overlap by about a fortnight, both forms being taken in perfectly fresh condition in the last week of March at Kizil Robat. The five specimens referred to above as a possible 3rd generation are interesting in that by their smallness and the depth of the green of the hindwing underside they recall somewhat the 1st generation. They are readily separated from the normal second generation specimens: it seems reasonable to suppose they represent a partial third generation.

Individual variation in the black markings of the forewing is considerable. 1 ♂ (Kizil Robat, 30th March 1919) has the black patch on the discocellular expanded to form a large cloudy area which fuses with the apical patch throughout the whole of its outer edge. The depth of the colour of the apical patch is very variable in the summer forms, in some light french grey, in others as black as in the 1st brood. 1 ♀ (Kizil Robat, 2nd April 1919) resembles the ♂ mentioned above, except that above, the extension of the patch is confined to the veins, but below, the whole of the disc is covered with scattered black scales."

There are two broods, very distinct one from the other.

1. *Wet season form* (=*belemia Esp.*).—*Upperside*—*Forewing*: Ground colour white, base black; a broad densely black oblong discoidal spot extending to, but exclusive of the costa, which is pink near the base. Apex black containing from 2 to 4 white spots decreasing in size from costa.

Hindwing.—Base black, remainder white.

Underside.—*Forewing* ground colour white; costa pink speckled with green. A broad sinuous black discoidal spot with central white lunule, its convexity inwards. At apex four green bands, the innermost being a mere spot, the outermost extending nearly to the tornal angle, with wedge-shaped white bands between them.

Hindwing.—Ground colour white with seven broad dark green bands crossing the wing vertically; a minute loop connecting band 3 to 2, a thick one band 4 to 3, so that band 4 appears to bifurcate; sometimes a small loop connects band 5 with 4, or 5 may join 6, but often extends only to the middle of the wing. These green bands have sharply defined margins and are broader than the glistening pearly white bands between them.

2 *Dry season form* (=*palestinensis*, Rober).—Slightly larger on the average.

Upperside:—*Forewing*: The base of the wing is white; discoidal spot narrower and less densely black, and black markings at apex less dense.

Hindwing—White.

Underside.—Costa pink striated with black. The green bands much less pronounced, narrower than the white bands, and much broken, forming a meshwork, their margins being very irregular. The white predominates over the green, the white being tinged with yellow on the forewing at the posterior end of the bands and in the hindwing across the middle of the wing from the base and near the green.

In both forms—Antennæ black above, pinkish white beneath and tipped with pink. Head black above, white below; hairs behind eyes orange-pink. Thorax and abdomen black above, white beneath. Proboscis and legs pink. Cilia black opposite veins, white between on forewing; white on hindwing.

Expanse.—1·6 in. to 2·25 inches.

A few examples were taken having very faint markings beneath. Three examples of aberration in which the dark markings on the forewing are in excess were taken. One of these, taken on March 30th, has the black of the apex

extended inwards to the innerside of the discoidal spot, which merely appears as a white semi-circle.

An egg, glistening pearl-white, seen laid on March 24th by a ♀, which was then netted, on the tip of a small bud in the centre of a group of buds in a young flower-head of a yellow crucifer like mustard.

On the 27th March this egg had become orange-coloured, and on 28th it hatched, the larva being pale green dotted with black, head black. It was seen feeding among the florets of the flower-clusters. This larva was subsequently lost. On March 24th a small grey larva with black head was found on a head of flower-buds of this yellow crucifer, where the young leaves near the buds had been eaten. On April 6th a female was netted after laying a glistening white egg on a young unopened bud of a mauve-flowered crucifer, the next day this egg had changed to dull yellow.

On 30th March (1920), on the Jebel Hamrin, at Fathah gorge, females of *E. belemia* were seen ovipositing on *Hirschfeldia adpressa*, Moench, a charlock-like yellow crucifer ; and on white mustard, *Sinapis alba*, L., a race, the egg being laid upon the young unopened flower-buds.

These plants were identified at Kew. The egg has about twenty longitudinal ridges with fine transverse ridges between and crossing these.

On March 28th (1919) three full-grown larvæ were found on seed stems of a yellow crucifer. One pupated the same evening head upwards on the thicker portion of the stem just below the seeds, the body-girdle being very slender, and the imago emerged on 6th April. The second pupated head downwards during the night on the same stem about four inches below the first pupa. This pupa dried up and died. The third larva escaped. Another larva found on March 23rd pupated head downwards on 27th and a butterfly emerged on April 5th.

A full grown larva measured $1\frac{2}{3}$ inch in length, tapered gradually toward either end, was dark green with lateral line bright purple above, white below. The dorsal line was dull purple, and the whole body minutely dotted with black. Head purple. The larva on changing on March 29th to the pupal state took, from the protrusion of the "beak", which emerged bent forwards, to the final shaking off of the larval skin, about one minute only. The pupa was green with long pointed mauve-coloured beak and at first had lateral purple and white lines, but these soon changed to pale green, uniform with the rest of the abdomen. From this pupa emerged at 7·37 a.m. on 6th April a female butterfly, the black and white markings of the upperside having been clearly visible in the pupa the previous day.

This butterfly was common on the banks of old canals and on the crests of stony hills at 600 feet and between them and the rivers Dyala and Tigris, flying hurriedly up and down the canal banks or about flower-covered slopes near the rivers, occasionally settling at flowers for a short time only. It is very active, though the female settles the more often. It is inquisitive, having passed the net it returns and hovers to and fro and so gives a chance of capture without a chase, which in the case of this active little butterfly is a consideration on steep stony ground. Large examples such as females may, when on the wing, be mistaken for *Pontia daplidice* though they are usually less inclined to settle than is that species. Both sexes were attracted by the smell of sulphuretted hydrogen from some oil drums, and, it seems by the scent of honey from some moths captured several years before, still retained by the net.

Localities :—Mesopotamia—Kizil Robat, and Jebel Hamrin and Jebel Kizi Robat near the Dyala. Wet. S. form end of January to end of March 1919 Dry. S. form end of March to mid April 1919, both broods common. Right bank of the Tigris—at and near Fathah, Jebel Hamrin. Wet. S. form latter half of March 1920. Common in Mediterranean region.

Synchlœ falloui, Allard, from Algeria to Somaliland and Arabia, is the only near relation to *S. belemia*, and so is mentioned here.

E. charlonia, transcaspica, Stgr. Seitz. 1.22c.

Male wings more rounded than *lucilla* ♂ and much paler yellow, about same tint as *lucilla* ♀ and, like, it with forewing paler than h.w. Upperside, colour pale sulphur-yellow, base of wings black. Forewing: discocellular broad, short, transverse oblique irregular oblong black bar as in typical *charlonia*, not so large and rectangular as in *lucilla*, and not quite extending to the costal margin: Apex black with pale spots. Hindwing, uniform immaculate: underside forewing yellowish white, pale yellow in cell; the discoidal spot black and oblong: costal and terminal margins pink. Hindwing and apex forewing green of the same tint as *lucilla*, but the white central spot of hindwing smaller and with very small white spots on costal margin intermediate between the veins. Antennæ cream-white, tips yellow.

Expanse.—1·5 inches.

Capt. Riley notes of this:—"Of the typical *transcaspica* (2nd generation) form. The first brood (? January-February) form has been named *vernalis* by Verity. LeCerf records it from Danoh Konh, and says it is slightly intermediate; the specimen referred to above agrees very well indeed with transcaspian specimens in the B. M."

This male in fresh condition was taken by the writer on 11th April 1920 on a small hill-crest about 500 feet elevation on the Jebel Hamrin ridge at the Fathah gorge on the right bank of the Tigris. Its habits seem to be identical with those of *A. lucilla*, which is very active, keeps much on the move and has a hurried flight, keeping usually a foot or so above the ground on which it occasionally settles with open wings.

Locality:—Mesopotamia—Jebel Hamrin range on the right bank of the Tigris at Fathah gorge, on April 11th.

E. gruneri, H.-S., ssp. **armeniaca,** Chr.Seitz. Vol. 1. 22 g.

Captain P. A. Buxton obtained it commonly at Menjil towards the end of March 1919, flying amongst thick bushes in a gully. *E. gruneri* H. S., which is yellow, is found in Turkey and Greece. *armeniaca* is a white race flying in Armenia, South Asia Minor, North Syria and North Mesopotamia.

GENUS GONEPTERYX, Leach.

G farinosa, Zeller. Seitz. Vol. 1.42.b:

KEY: Very similar to the English "Brimstone," only with mealy appearance on the upperside, and the orange discoidal spots of forewing are minute or absent.

Two males were taken in the Karind Valley, N. W. Persia, at 5,300 to 6,000 elevation in mid-July, one of them in a vineyard, the other in a glade in a wood.

They are slightly larger and have smaller orange spots than either *rhamni* type or *r. nepalensis*; the hindwing being paler than the forewing, and the butterfly when flying looked at first sight very like a *Catopsilia*.

Localities.—Greece, Asia Minor, W. Asia.

There are two named sub-species:—

centralasiæ, Stgr., from Turkestan, and *chitralensis*, M., from Chitral.

Food-plants—*Zizyphus jujuba* and *Z. vulgaris*.

Genus ZEGRIS, Ramb.

Z. eupheme, Esper. Seitz Vol. 1. 23 a.

Apex of forewing grey with orange centre. Underside of hindwing white with an irregular branching green patch partly tinted with yellow or sienna. This " orange tip " occurs in S. Spain and S. Russia, also through Asia Minor to Armenia, Caucasus, Syria and Persia. Its races intergrade, and the differences between them are slight. The typical form is from S. Russia and has normally a good deal of yellow on the *ground-colour* of the hindwing beneath, this containing only about 6 small round spots of white.

The butterfly has a remarkable discontinuity in its European distribution, there being no occurrence of the species between Spain and S. Russia. Its transformations are described by Hofmann and others.

Subsp. *meridionalis* Lederer, Seitz. Vol. 1 23b, from Spain has underside hindwing ground colour often quite yellow so that there are no white spots: specimens hardly distinguishable from type also occur.

Subsp. *menestho*, Menetries, from Asia Minor and W. Kurdistan is described as having f.w. with apex less black, powdered with light scales, underside of hindwing a clearer yellow with less green.

But the nearest named form to that here mentioned from the Dyala is *tschudica*, Herrich-Schaffer, Seitz. Vol. 1. 23 a, described as an aberration of the typical form from S. Russia, but occurring also in Syria and Caucasus, and having no yellow on hindwing beneath, but only green on white. Many examples, however, from Mesopotamia are " drier " still than this, having more white in proportion to green, also the green is more tinted with yellow or sienna especially in the later emerged examples. The National collection, it may be noted, has very few of these eastern or " dry " forms of *eupheme.*

The *egg*, taken from the abdomen of a *Z. eupheme tigris*, seen under the microscope, is a broad stumpy sugar-loaf cone with slightly rounded base. One seen 'end on' showed fifteen longitudinal ridges, and also fine transverse ridges between them, each distant from the next by about a third of its length. Breadth to length of egg is as 3 to 4, it being much broader comparatively than the egg of either *E. belemia* or *E. ausonia.*

Larva.—The larva is shaped like that of *Euchlœ*, but is hairy and, it is said, spins itself a cocoon of stout silk attached at both extremities by threads, in this cocoon-making habit resembling the Papilionid genera *Thais* and *Parnassius.* Seitz says : " Larva thick, cylindrical, densely hairy. Pupa stout, with a dense cocoon, in which one finds still a remnant of the thread characteristic for pupæ of Pierids ". The genus is based chiefly on the larva. Two other species occur, *Z. fausti*, Chr., from C. Asia, with a brick-red " tip " ; and *Z. olympia* Edw., from Texas.

Kane says : Food plant. *Sinapis incana* and a species of *Raphanus*, etc.

Subsp. *dyala.* Peile. See Plate. Fig. 1·2. ♂ ♀.

Description :—Upperside.—Forewing. Ground-colour white. Costa sinuous in outline. Discoidal spot black, convex on basal side, concave exteriorly. Apex inner third black turning outwards at an angle to join costa, middle third an elongated bright orange patch which varies slightly in size and forms an angle with a white subcostal bar, outer third grey. The orange patch usually less, and grey apex darker than in *menestho* and not tinged with yellow. Hindwing white, with markings of underside showing through slightly. *Underside* f.w. ground colour white. Discoidal spot dense black as above. Apex with a few touches of yellowish green. Hindwing, an irregular green patch, the shape of which, on the right side, may roughly be compared with that of the map of England and Scotland, with two broken up prolongations of the colour of raw sienna and green towards the costa. These prolongations vary much in

breadth and in the amount of yellow about them, but are less than in Seitz's fig. of *tschudica*.

♀ slightly the larger as a rule; the orange patch at apex of f.w. usually smaller, sometimes yellowish, and rarely absent (*ab. luctifera*, Verity).

Head much tufted with hairs. Palpi short. Antennæ short with thick club. Legs thick and short. LeCerf has figured this form, but as *tschudica* to which it does not belong.

Locality.—Common in Mesopotamia from 350 to 600 ft. elevation, in March and April about low hills and plateaux near the river Dyala, especially about two common species of crucifer, one having yellow and the other mauve flowers. The males are active, scurrying about and also settle at flowers.

The butterfly varies but little. The orange patch on the forewing is a little larger in some males than in others, and, as before mentioned, in the female may rarely be absent.

Expanse.—44-49 mm. Br. Mus. Types, No. Rh. 163 ♂, 164 ♀; ♂ 29, ♀ 22, from Kizil Robat taken between 25th February and 6th April 1919.

Habits.—It is a fast flier, but is easily taken at crucifers which it frequents. Flight rather like that of *P. daplidice*, settles more about 10 a.m. than later, when it is much on the wing, flying fast and making the chase rather difficult over the rough stony ground where the loose stones are hidden by the grass and flowers. On March 24th a female was seen to lay a glistening pearl white egg, very similar in appearance to that of *E. belemia*, on a young head of flower-buds of the common yellow crucifer. This had changed to orange on the 27th and to blackish grey on the 30th. On March 24th another was seen to lay a similar egg on the tip of a central small unopened flower-bud of wild mustard. A pale green cylindrical larva, of normal Pierid shape, finely dotted with black and covered with short hairs, was found on a seed stem of this yellow crucifer about the end of March and was perhaps a full grown larva of this species, but being hairy was thought at the time to be the larva of some moth and so was not kept.

On April 9th a worn female *eupheme* was seen to settle at some half dozen young flower-clusters of this yellow crucifer and on one of a mauve-flowered crucifer, and was seen to apply the tip of the abdomen to the flower-buds. The butterfly was netted and these flower-clusters taken back to camp and there examined with a lens, but no egg could be seen on them although the abdomen of the butterfly was found to contain 9 eggs. Length to breadth of egg is as 4 to 3.

This species was first observed on February 23rd and was commonest in the second week of March. On June 25th dry seed-stems of crucifers where the butterfly had previously been common, were carefully searched, but no cocoons could be found, so they are probably at the roots. In April 1920, a larva purple with yellow dotted line, was found on a yellow crucifer on a hill-crest at Fathah which turned to be a 'beaked' pupa which suspended itself with body-girdle like other *Euchloe* pupa, and was very probably of this form. It died as a pupa.

Z. eupheme dyala, Peile. (Etom. 54, p. 151, 1921). Ann. Mag, Nat. Hist., Vol. 8, p 591. See also Plate. Fig. 1 2.

Of 26 ♂, 26 ♀ (now incorporated in B. M. collection), and 6 more. Capt. Riley notes:—

"In some five females the apical patch is entirely deficient of orange (=ab. *luctifica*, Verity) and in a number of others it is very much restricted or nearly obsolete; the males too show a considerable amount of variation in the extent of the orange.

Resembles *tschudica* in the whiteness of the apical area of underside of forewing, but can at once be separated from it by the far greater reduction in the extent of the green mottling of the underside of the hindwing.

There are three pairs of typical *tschudica* in the B. M. from S. Russia, all of which agree far better with Herrich-Schaeffer's figures than do these specimens from the R. Dyala.

I suspect that the ♂ mentioned by LeCerf taken at Danah Kouh April 1908, is referable rather to this race than to true *tschudica*."

Z. eupheme tigris, Riley. Ann. Mag. Nat. Hist., Vol. 8, p. 591.

13 ♂, 4 ♀ (now in B. M.) taken at Fathah on the right bank of the Tigris from 3rd March to 5th April 1920, Capt. Riley remarks :—

"This race, like the preceding, comes very close to *tschudica*, H.-S. It can, however, be separated at once from that by the yellowness of the apical area of the underside of the forewing, this area being white in Herrich-Schaeffer's figures (Schmett. Eur. f. 449-453) with the exception of the extremes of the inner edge, uniformly yellow in *tigris*. The mottling of the underside of the hindwing also has considerably more yellow in its composition than is the case in true *tschudica*. Two males approach *menestho* in the richness of the underside coloration; one approaches *dyala* in the poverty of it. The extent of the orange in the apical patch on forewing above is on the average, appreciably greater than is the case in *dyala*.

B. M. Types No. Rh. 165 ♂, 166 ♀.

At Amara on 20th May 1918, the writer saw an 'orange-tip' with yellow tinged ground-colour on hindwing which was probably a very late example of this f. *tigris*. It was going from flower to flower in a garden, and was then mistaken for *Ixias pyrene*."

GENUS COLIAS, Fabr.

C. croceus, Fourcroy (=**edusa,** Fab.) Seitz., 1.26g.

Of 60 ♂, 90 ♀ now incorporated in the National Collection, and 17 more from Amara, Fathah Jebel Hamrin (River Dyala), Kizil Robat in Mesopotamia; and Paitak and the Karind Valley in Persia.

Capt. N. D. Riley remarks as follows :—

"A magnificent series. The Persian specimens cover the dates 14th July-10th September; the Mesopotamian series represent captures in nearly every week of the months January-July (middle). As regards size they range from an expanse of 3·7 mm. (♀ Jebel Hamrin. 3rd July 1918) to 5·4 mm. (♀, Amara, 26th May 1918.) The January and February specimens are noticeably and consistently smaller than those of any other month with the exception of the one very small female mentioned above, and an exactly similar one from same locality, dated 10th June 1918.

The amount of variation in colour and markings is remarkable. 1 ♂ (Kizil Robat, 22nd March 1919) has ground almost lemon-yellow instead of orange: some examples in which all the veins are marked with yellow across the outer marginal border, are referable to ab. *faillæ*. Stefanelli: of the females almost exactly 33⅓ per cent. are of the white *helice* form; 2 of the ♀ f. *anbuisonni*, Caradja, intermediates in which the yellow has failed; 1 of the ♀ f. *helicina*, Oberth, an intermediate form in which the red pigment is absent, leaving the specimen a delicate lemon-yellow.

For the rest no two specimens are alike, so it would serve no useful purpose to go into details."

There appear to be several broods of the "clouded yellow" in the year in Mesopotamia. It is very common, especially about the end of March, and is widespread from the banks of the Tigris to the highlands of Persia. Near the Dyala it frequents slopes where its food-plant, a small yellow-flowered trefoil

grows on the fringes of the plateaux, and in vegetable gardens and about patches of lucerne.

Among some large bright orange examples of the summer form taken in Mesopotamia in July are a few having a white centre more or less distinct to the black discoidal spot on the underside of the forewing, but no other resemblance to *C. fieldi*. At Harir, at 5,300 ft. in W. Persia in July, some specimens were taken having this discoidal spot black, the discoidal cell yellow anteriorly and orange posteriorly, the remainder of the underside being markedly green.

As in other parts of its range, the green appears to be most marked in the earliest or "wet" brood and in those found in the highlands; the underside in June and July in Mesopotamia, or by the Dyala at Kizil Robat, being more "dry", *i.e.*, more yellow than green. As elsewhere the females vary in shade.

White (*pallida*, Tutt), but not cream-coloured (*helice*, Hb.) forms were common: one taken at Mirjana on Jan. 28th, 1920, was of the faintly yellow-tinted form *citrina*; another more like *helice*, Hb., was taken on June 13th, 1920, at Baiji. White females with much grey above were common at Lucerne. One dull cream coloured *helice* form was taken with a slight edging of orange along the posterior margin of the forewings. When in the paper envelope this one laid eggs of the usual spindle shape and yellowish pearl colour. At Amara in May 1918 and at Baiji in June 1920 very fine grey white females with pale discoidal spots on the hind wings and much grey above were taken. On 21st April 1919, at Kizil Robat, a white female was taken in copula with *croceus* male, and similarly another on 3rd June (1920) at Baiji, the male doing the flying. On stony-slopes near the Dyala at Kizil Robat about 8 o'clock in the morning in early April one could be fairly sure of putting up some white females of *croceus*. Early in June at Baiji both yellow and white forms of the female were seen laying eggs singly on the upper side of leaves of lucerne about the middle of one half of the leaf, the butterfly settling but a short time to deposit each egg and then going on to other leaves near-by. White clover was more plentiful than the purple flowered lucerne, but the eggs were laid on lucerne.

The *egg* of yellowish pearl colour when just laid, changing later to salmon-pink, appears slightly smaller and narrower than the egg of *E. belemia*, although of the two butterflies *croceus* is much the larger. It is spindle shaped, the top being pointed like the fuze-cap of a shell. 19 longitudinal ridges were counted: a few of these coalesce and some do not quite reach the top of the egg. There are fine transverse ridges. Figures of the various stages can be seen in South's and Kirby's works.

Larvæ.—At Baiji in May and June two rugose dark green cylindrical larvæ were found on lucerne, having white lateral stripe, and on each segment a minute black spot just below the stripe and a touch of red on the white stripe just above the black spot. These fed on lucerne until they pupated; one on 25th May suspended horizontally from the petiole of a lucerne leaf, the tail end being towards the stem of the plant; the other pupated on 21st June upright against the main stem of lucerne.

Pupa.—Stout and thick, the wing-cases being very prominent so that it appears pigeon breasted and with a dorsal hump. In the horizontal one the body girdle was remarkably long so that the pupa swung freely. Colour in one at first semi-transparent green of the same shade as the leaves; in the other pea-green, this again much resembling the leaves. One of these pupæ, as the leaves become more yellow, also changed maintaining the resemblance. On the fifth day the orange of the forewing showed through the pupa-skin as also a dark central mark on each wing and at the end of each vein a minute black spot. On either side of the ventral surface of the first three visible abdominal segments was a brownish black-streak. On the sixth day the markings of the forewings showed so distinctly that the sex of the enclosed butterfly could be determined. The cilia and antennæ were marked out in rose-pink. From the pupa of

25th May a male *croceus* emerged about 10 a.m. on 1st June ; and from that of 21st June a yellow female *croceus* emerged about 5 a.m. on 27th June (1920). At Kizil Robat, from an egg seen laid on a small yellow flowered trefoil, a larva was reared upon the same plant and a male *C. croceus* resulted.

Localities.—The butterfly is very common in Mesopotamia, especially about patches of lucerne, in vegetable gardens and on slopes where the small yellow flowered trefoil grows on the fringes of the plateaux. It is very common in March, early April and June.

Mesopotamia.—Sheikh Saad ; Wadi river near Kut ; Amara, Baghdad, Kizil Robat, Baiji, Mosul.

S. Kurdistan.—Jujar (end of November).

N. Persia.—Karind Valley ; and abundant throughout Europe.

GENUS COLOTIS, Hb. (TERACOLUS, Swains.)

C. fausta, Oliv. Seitz. 1.23c.

Of 31 ♂, 41 ♀ (13 ♂, 19 ♀ of these now in the B. M.) examined, Capt. Riley notes :—

" The series shews very considerable variation in size, depth of colouration and markings, but, according to the dates on the specimens, this does not seem in any way to coincide with any month or months in the year. The extreme forms in the direction both of ' wetness ' and ' dryness ' were all taken at Jebel Hamrin (R. Dyala,) within a few days at the beginning of July. These include a large and very heavily marked (wet) pair ; a smaller male in which the marginal markings of the forewing above are reduced to a darkening of the extremities of the veins only; females ranging in colouration from that of the male to a pale yellowish pink and 1 ♂ which, but for a faint pink tinge on the hindwings, is pure white due to failure of pigment presumably, as the shape and structure of the scales appear to be perfectly normal."

Buxton took this at Amara from 11th September to 4th December and at Shahrobau and Baqubah, 29-31st July ; Qasr-i-Shirin, 24th November 1918. " Rests at night among the yellow-green twigs of *Sueda.*"

Abundant in Mesopotamia and North Persia, from the middle of June to the end of November. There are two well-marked broods, that of the dry season up to mid-October, when the second brood, larger and with darkly marked underside appears and is very common, especially at flowering mint by water. In September and October 1918 the butterfly was seen migrating in considerable numbers. A gynandromorph with left side male, right side female, is in the National Collection ; it was taken at Amara by Major R. Brewitt Taylor, August 3rd, 1916.

On July 6th eggs were seen to be laid singly upon the upperside of the leaves of a round-leaved thorny caper (*Capparis spinosa*, L.) which has a very beautiful rather large white flower, with long white stamens which turn mauve, and curious green fruit about the size of a small lemon, the skin of which splits irregularly into three portions each of which curls backwards towards the stem exposing a crimson jam-like substance attached to it and in which the seeds lie embedded.

This food-plant not being in leaf earlier than June no wet season brood was seen in Spring, when " wet " forms of other species are about, although a well-marked wet-season form appears in large numbers in October as already stated

Period. June 15th to December 31st.

Localities.—Mesopotamia.—Basra, Oct. and Nov. Kut, common, " not seen until June ; " Baghdad ; Banks of Dyala at Jebel Hamrin and Kizil Robat ; Khanikin, *N. Persia* - Seripul, common; Harir, 5,300 ft. very common in Sept Kermanshah, Sept. to 10th October scarce.

LYCÆNIDÆ.

Key to the forms of *Lycæninæ* of *Mesopotamia.*

A. Hindwing: Without tail.

a. Upperside, brown without blue; a complete subterminal series of black spots and orange lunules. Underside forewing a basal blackspot .. .. ..*Lycæna astrarche.*

b. Upperside, ♂ blue. ♀ brown.

a^1. ♀ with more or less blue; an incomplete subterminal series of black spots and orange lunules. Underside forewing no basal spots .. .. ..*L. icarus.*

b^1. ♂ sky-blue. Black spots on underside conspicuous ..*L. bellargus.*

c^1. ♂ satiny blue; ♀ brown, veins darker; Underside cream, spots minute ..*L. dama karinda*

d^1. Smaller, Exp. 30 mm. ♀ dark brown. Underside spots larger.*L. damone damalis.*

c. Upperside, brown, underside hindwing, a row of 3 subtornal jewelled black, orange circled spots .. ..*Chilades trochilus.*

d. ♂ violet blue and brown above. ♀ brown.

a^1 Underside. Hindwing, two subcostal and another basal prominent black spots ..*Chilades galba.*

b^1 Underside f.w. with many jet black spots: no jewelled spots, a black spot in middle of cell of forewing .. ..*Zizera karsandra.*

c^1 Underside, black spots minute. No jewelled spots, no spot in middle of cell of forewing ..*Zizera otis.*

e. ♂ yellowish tawny; ♀ pale brown .. ..*L. peilei.*

B. Hindwing: with a short filamentous tail.

a Forewing: veins 11 and 12 anastomosed. Underside white spotted with black or brown: a subterminal series of spots, some with shining metallic scales ..*Tarucus theophrastus.*

b Forewing, veins 11 and 12 not anastomosed, but an oblique short bar between them near base. Underside banded with pale grey or brown .. ..*Lampides boeticus.*

C. Upperside more or less copper-red

a with dark outer border and spots.*Heodes phlæas.*

b more yellow-gold in colour; filamentous tail to n. w. ..*H. thersamon kurdistanica.*

GENUS LYCÆNA, Fabr.

L. astrarche, Berg. "The brown Argus". Seitz. 1.79k.

Upperside—Fore and hindwings brown without any blue colouring; a black discoidal spot; a well marked subterminal series of black spots bordered outwardly by orange-red lunules complete to apex.

Localities.—Kizil Robat, a few taken in April and May. Kirkuk, a ♀ on 16th October 1919. Very common in the Karind valley at 5,500 ft. in July and August.

Of 36 ♂, 24 ♀ examined (19 ♂, 18 ♀ of these now in B. M.). Capt. Riley notes:—

"Exceedingly variable both in size and markings. The short series from Kizil-Robat (spring forms) are presumably referable to f. *sarmatis*, Gr. Gr., on account of the white undersides and the width of the orange bands below; the N. W. Persian series (July-September) agree with them in respect of the latter feature, but have the characteristic yellowish brown undersides of the summer forms and would best be called f. *æstiva*, Staud."

L. icarus, Rott. *var* **persica,** Bienert. Seitz. 1.80g.

"The Common Blue." Male, upperside purplish blue with rich satiny lustre, and anticiliary slender black lines. Female, upperside very dark brown with more or less blue irroration, and a subterminal series of conspicuous orange-red spots, the spots becoming obsolete towards the apex of forewing. Underside male pale grey, female brownish grey, with a number of white encircled black-spots and on hindwing a postdiscal series of black lunules outwardly bordered with reddish brown. A basal black spot on forewing.

Localities.—Mesopotamia: fairly common. Kizil Robat, N. W. Persia: "Seripul where it was flying in numbers on 3rd September 1918. By far the commonest Lycænid at Kermanshah" (Broughton).

Kizil Robat, Mesopotamia, 14 ♂, 5 ♀, May-June, July 1919.

Some of these ♀s have much white on hindwing above just within the orange lunules.

N. W. Persia: Kermanshah. 4 ♂, 3 ♀, late August 1918; Harir, 21 ♂, 3 ♀; Karind Gorge, 8 ♂, 6 ♀, July, August, September 1918.

Small form, dwarf only, 8 ♂, 3 ♀, July, August 1918, Harir.

29 ♂, 17 ♀, of these are now in the National collection. Buxton took 3 "very ordinary looking" at Menzil, 7th April 1919; and Qazvin, August and September 1919, "extremely brown below."

L. bellargus, Rott. Seitz, Vol. 1., 81b.

1 ♂, 9th August 1918; 2 ♂, 1 ♀, 16th August 1918, now added to B. M. collection.

Only one specimen from Persia (1 ♂) in B. M. previously.

L. (Polyommatus) dama sub-sp. **karinda,** Riley. A. & M. N. H. Vol. 8, p. 597. See Plate Fig. 8·9.

16 ♂, 12 ♀, of which seven pairs are now in the National collection, taken at Harir (5,300) and Karind Gorge (6,000) from 14th July to 9th September 1918. On 12th August males were common.

Note by Capt. Riley:—"Differs from typical *dama* in that the discal series of spots on underside of hindwing is always complete though the spots composing it are minute. The marginal and submarginal markings also more fully developed. In the female the veins on upperside are conspicuously darker."

B. M. Types No. Rh. 75 ♂; 76 ♀, 16th July 1918. Karind Gorge.

LeCerf (Ann. d'Histoire Nat. II. Pt. II. p. 69, 1913) records '1 ♂ *L. dama* rom Deh Tchechma, Arabistan, Persia, 31, VII, 1895,' otherwise it would

appear only to be known from Staudinger's original locality, Malatia, Mesopotamia. LeCerf's specimen, however, is probably referable to *karinda*.

This form was taken in company with the two next mentioned and other species of Lycæna at flowers in glades and waste ground by a stream.

L. (Polyommatus) peilei, Bethune-Baker Plate, Fig. 15·16.

Described by G. T. Bethune-Baker, in the Entomolgist's Record Vol. XXXIII, pp. 63-64, 1921.

"An extraordinary and beautiful new Lycænid belonging to the *dama* section of the genus *Polyommatus*.

♂ Both wings yellowish tawny colour (the exact colour is very difficult to describe, at first sight it looks almost orange), the prevailing tone is deep yellowish. Primaries with an abundant supply of greyish androconial hairs and small scales, which give the wing an unusual aspect. The secondaries are almost free of these scales except in the basal area. Fringes grey, the basal half being darker than the terminal portion.

Underside.—Both wings cream colour with a slight pinkish tinge, with blackish spots palely encircled. Primaries with a dark crescent closing the cell, a postmedian line of six spots, the lowest one being double, those in the radial area are excurved, the fourth and fifth spots recede sharply basewards, the sixth (double spot) is shifted outwards.

Secondaries, with all the spots very small and inclined to obsolescence, but the two subcostal ones, *viz.*, that near the base and that half-way along the costa, always present and definite though small, the spots in the postmedian row are reduced to mere points and are often absent. there is a trace of a submarginal row of dashes of the ground-colour edged with a tone of cream colour paler than the ground.

♀ Pale brown colour, otherwise like the male on the underside.

Expanse.—♂ 38-42, ♀ 38 mm.

Habitat.—Karind Gorge (N. W. Persia), 6,000 ft. July (H. D. Peile).

Types in the British Museum, six ♂♂ and one ♀. (B. M. Types, No. Rh. 179 ♂ ; 180 ♀, 17th July 1918, Karind Gorge, & co-types.)

"The Karind Gorge is just over the Persian frontier.

It is I think the most extraordinary Palearctic species of the true *Lycæninæ* that I know, its colour separates it from everything, but the underside pattern shows it to be a near ally of that beautiful species that Staudinger called *dama*, with which indeed it was flying when Lt.-Col. Peile captured it. The androconial scales also connect it closely with the *dolus* group."

Taken at flowers in glades, 14th to 17th July 1918. None seen 12th August.

The male is easily recognized on the wing : but the underside in both sexes makes them readily mistaken, when settled, for the races of *dama* and *damone* with which they are found.

L. (Polyommatus) damone, subsp. **damalis,** Riley. A. & M. N. H. Vol. 8, p. 597. See Plate, Figs 13-14.

35 ♂, 17 ♀ of which a series of 12 pairs are now in the National collection.

Taken at same localities—Harir and Karind Gorge—as *dama* from 13th July to 12th August 1918, and distinguished from that in the field chiefly by being smaller and having generally more conspicuous spots on the underside ; the females being more uniformly brown above. As with *dama* the females average slightly smaller than the males. More robust and the males more decidedly blue than *damonides*, Stgr. Capt. Riley notes as follows :—

"Nearest the var. *xerxes*, Staud, in colour, and in that the hindwing underside is entirely devoid of any trace of the longitudinal white stripe ;

but differs constantly in its much larger size, 30mm. and more, whereas *xerxes* is 23-24 mm.; and in being entirely devoid of any trace of basal green scaling on the underside of both wings. The upperside colouration of the ♂ is perhaps a shade paler and brighter than in typical *xerxes*, and the hind-marginal orange lunules in the female more pronounced. The general colouration of the underside in the male lighter, more greyish, less brown than in *xerxes*; in the female of a more yellowish brown. The discoidal spot on the forewings is anteriorly more acute than in any *xerxes* examined."

B. M. Types Nos. Rh. 177 ♂, 13th July 1918; 178 ♀, 16th July 1918, Karind Gorge..

This form was about twice as numerous as *dama karinda*, but not taken later than 12th August, most of the few then being females, whereas *dama karinda* was taken up to 9th September.

A form smaller than the last above mentioned and having a conspicuous pale streak on the hindwing beneath, was taken by Capt. Aldworth at Suwarra in July 1919. This may have been either f. *carmon* or *actis* of the *damon* group. A few specimens were shown to the writer at Mosul.

L. admetus, Esq. Seitz. Vol. 1,81C.

One pair taken by Capt. Aldworth at Suwarra, 4,500 ft., July 1919.

L. baton, sub-sp. **clara,** Stgr. Seitz. I. 79d.

Harir, N. W. Persia, 2 ♂, 3 ♀. Taken at flowers of mint on damp ground at 5,300 ft.

Not separable in any way as a race distinct from *clara* the Asia Minor-Turkestan subspecies.

Taken also by Capt. Aldworth at Suwarra, Kurdistan, July 1919.

Genus HEODES (Chrysophanus, Bdv.)

H. phlœas, L. "The small copper." Seitz. 1.77b.

The spring form is very like the English form, forewing copper with black spots and dark border.

The summer form is like ab. *eleus*, F., the male sometimes appearing as dark on the wing as an *Ypthima*.

Of 48 ♂, 52 ♀ examined (27 ♂, 30 ♀ of these now in B. M.), Capt. Riley remarks:—

"The series shows specimens taken in every month of the year except December and January. February, March, April and May specimens are all of the typical *phlœas* form, and so is the single October specimen.

The remainder, June-September, are of the form *eleus*, and, as is usual with the species throughout its range, very variable. The tendency to blue spotting of the hindwing above is very marked, which seems rather surprising as, in this country at any rate, the increase in these blue marks seems to be the result of a wet habitat. Specimens from lowlying wet pastures usually seem to have them largest. The form has been named *caeruleopuncta*. Staud.

There are such numbers of aberrational names applied to this unfortunate species that it is impossible for me to attach any of them to anything—I am afraid I must disregard them."

Regarding the tendency to blue spotting mentioned by Capt. Riley, it is worth mentioning that the majority of the specimens were taken either in a damp meadow or about the banks of rivers or canals.

Localities.—Mesopotamia, common. Kizil Robat, spring form from February to the end of April. Summer form end of June (bank of Dyala, Jebel Hamrin). N. W. Persia: Karind valley, the dark form very common from mid July and a

few still about in mid September. Baghdad, 28th October to 30th November. (Spring form).

Kermanshah, "Common about cultivated ground and around bramble bushes" (Major Broughton).

H. thersamon, kurdistanica, Riley. A. & M. N. H. Vol. 8, p. 598.

31 ♂, 34 ♀ (18 ♂, 18 ♀ of these now in B. M.) taken at flowers in a meadow and glades at Harir, Karind Gorge and Kermanshah in N. W. Persia. Capt. Riley's note on these runs:—

"These specimens are characterised by their small size on the whole, especially the September ones, and the lack of any fiery tinge in their colouration; they are a much more yellow-gold even than usual in European *thersamon*, though not nearly so golden as *ochimus*.

The underside colouration is more uniform than in typical *thersamon*, the hindwing ground-colour approaching that of the forewing, and the dark spots are much reduced in size. The hindwing tails are comparatively long."

Type ♂, Harir, 19th August 1918; ♀, Harir, 20th August 1918. (B. M.) (Types No. Rh. 181 ♂; 182 ♀).

persica, Mén., was described from N. E. Persia and is said to be a fiery golden colour, large with a dark border.

H. thersamon, Esp. one female, very worn, 17th July 1919, Qasvin. (Buxton).

GENUS CYANIRIS, Dal.

Cyaniris argiolus, L. itz. Vol. I,83g.

13 ♂, 7 ♀ (8 ♂, 7 ♀ of these now in B. M.) taken by a brook at Harir (5,300 ft.) in N. W. Persia.

Underside markings very faint on the whole, n some (August) specimens almost entirely absent=f. *hypoleuca*, Koll.

GENUS ZIZERA, M. (ZIZEERIA, Chapman).

Z. karsandra, Seitz. 1.295.

♂ violet blue with broad brown border above. Underside, grey with jet black conspicuous spots, and a black spot in middle of cell of forewing. Female above pale brown. Common, especially about cultivated ground, and widespread. Basra, Amara, Kirkuk, etc., and in Europe and Asia.

Of 11 ♂, 10 ♀ (now in B. M.) and 14 others, Capt. Riley remarks as follows:—

"I call this *karsandra* rather than *lysimon* in view of Chapman's able paper on the group in Trans. Ent. Soc. Lond. 1910, p. 480. He says *lysimon* is African, *karsandra* Asiatic, *inter alia*. These specimens agree with *karsandra* type and with Chapman's figures and description."

Z. otis, Fab. Seitz. 1.295 "♂ Kizil Robat, October 18th" (Lt.-Col. Watney).

"I got another species of *Zizera* (besides *Z. galba*) at Kut, probably *otis*, but the specimens were destroyed by ants" (Broughton).

GENUS CHILADES, M.

C. galba, Lederer. Seitz. 1·77k, described from Palestine. The veining, basal black spots and 2 jewelled black tornal spots on underside of hindwing are more like *Chilades* than *Zizera*; and *Chiludes phiala*, Gr. Gr. also in Seitz. Macrolepidoptera, Pl. 77k, and of which the types from Bokhara are in the British Museum, is identical with *galba*. *galba* is abundant in the hot months

about *Acacia campbelli*, Ainoff, which is widespread generally as a stunted bush in Mesopotamia, (though at Kut it grows to five feet), Kurdistan, etc., and is about the same size as *Z. lysimon*.

Of 56 ♂, 46 ♀ (18 ♂, 21 ♀ of these now in B. M.) examined, Capt. Riley remarks :—

"The species is sometimes placed in *Zizera* sometimes in *Chilades*. I don't know which, if either, is correct."

"Apparently not recorded from Mesopotamia before. There is a nice little series in the B. M. from Amara (B. Brewitt-Taylor) taken in July-August 1916."

Although the butterfly is found in immense numbers in June and July about the food-plant, which is also abundant in Mesopotamia, comparatively few larvæ were found. The presence of several small ants about the end of a young shoot generally indicated a larva there. Small predacious wasps and a large red ant frequent these plants and probably carry off many of the larvæ of this butterfly.

A female *Z. galba* was seen to lay an egg on a very small shoot in the axil of a young leaf.

Egg. The egg was immediately examined under a fairly high power microscope. Shape flat and rounded about twice as broad as high, and with a small concavity in the centre above. The surface is covered with prominent tetragonal reticulate white projections on a ground of pale sea-green, the central depression being also pale green.

Larva. De Niceville's description of the larva of *Chilades trochilus* quoted by Col. Bingham, would do very well for this also. The following modification of it is made for *galba* :

> Of the usual wood-louse shape when full grown, seven sixteenths of an inch in length. Head when at rest hidden by the second segment which overlaps the bitten end of the stem like a flap, the larva lying along the stem. Colour pale green at all stages, of the shade of the young leaves of the food-plant (*Acacia campbelli*). The very young larva, just having thrown of its first skin, seen under the microscope shows the brownish black head, segments and hairs very distinctly. The head black, smooth and shining, with a dark green dorsal line down the body from the 3rd to the 12th segments ; on either side of this a rather conspicuous pale whitish line, next to it a narrow pale green line, then two parallel narrow pale lines, with a narrow dark green line between them, these being much less distinct. Then a pale green line below which is an almost pure white lateral line below the spiracles, which is the most conspicuous of all the markings. These various parallel lines are divided up by the segmental constrictions which are rather deep. The whole surface of the body slightly shagreened, being seen, under a lens, to be covered with extremely fine short downy hairs, which are more evident at early stages than later. The usual extensile organ on the 12th segment. Each larva is diligently attended by several small brownish black ants which run about over its body, apparently attracted by some secretion from between its segments. The larva takes no notice of the ants running about over it. Mr. C. W. Crawley kindly identified this ant as *Monomorium* (*Paraholeomyrmex*) *gracillimum*, Smith.

Pupa. Three tenths of an inch in length.

Two larvæ, enclosed with the food-plant, on which they were feeding, in a glass shaving soap tube, pupated one on the glass side, one in the angle between this and the bottom, and not on the plant, and were attached to a silk pad formed on the glass ; and in one the body-girth was very distinct producing a slight constriction on the pupa. The pupæ examined with a hand lens did not show any hairs on them. In this detail and in the method of pupation

these two pupæ did not conform to the details noted by Dé Niceville for *Chilades laius* and *Ch. trochilus*. Shape short and thick, with constriction behind thorax. Thorax and abdomen dorsally prominent, straight, ventrally smooth. Colour at first green, wing-cases whitish and waxlike and semi-transparent, the abdominal contents appearing opaque. About the 4th day the thorax is grey, eyes black, conspicuous, antennæ brown. Wing-cases pinkish waxlike. abdomen green with the segments indicated. Late on the 5th day after pupation thorax and wing-case become chocolate brown, sharply distinct from the pale brown abdomen.

Both male and female emerged on the 6th day after pupation, at about 8 o'clock in the morning.

By keeping the larvæ and pupæ in the glass shaving soap tube with the cap on, the small destructive black ants were kept off them; whereas the attendant ants left with them did no harm.

Habits. Soon after sunrise the butterflies settle about the plants with their wings half open to the sun; later on they fly about more actively and more often close the wings when they settle. The butterfly is especially abundant in the hot weather in June and July about the food-plant (*Acacia campbelli*).

The very close resemblance of its larva to those of *Chilades laius* and *Ch. trochilus*—the similar venation to that of *Chilades* and the presence of jewelled tornal spots and very prominent basal black spots on the hindwing—and the fact that *Chilades phiala* Gr. Gr. is identical with *galba*, should be considered in deciding whether *galba* should be grouped under *Chilades* or *Zizera*.

Localities.—Mesopotamia: Kut, Kizil Robat, Baiji, etc. S. Kurdistan: Suleimanyeh, Sept. 1.

C. trochilus, Freyer, Seitz. Vol. 1. 77k.

A male taken at a flower on the plateau near Kizil Robat on 25th June 1919.

This is the smallest butterfly of Europe, Mesopotamia and India.

Expanse—0·6 inch.

Ranges from Africa through Arabia and India to Australia.

Genus LAMPIDES (Polyommatus).

L. bæticus, L. "The long tailed Blue." Seitz. I. 77h.

Key: Upperside, male purplish blue; female brown with some blue scaling and often a white band and four dark spots—always two—on hindwing. Beneath: the male banded grey, the female brown, a black spot in interspace, another in interspace 2, margined inwardly with ochraceous and both spots having metallic bluish green scales. It is very active and frequents cultivated ground, especially bean-fields.

Localities.—Mesopotamia—common generally; also widespread.

Genus TARUCUS, M.

T. theophrastus, Fab. Seitz, Vol. 1·77i.

Male. Upperside, pale violet, the markings of the underside apparent through transparency. Underside white with black or brown spots. all or some of the subterminal series on hindwing having shining bluish metallic scales.

Female, upperside dark brown, bases of wings suffused with blue: a white area and black bands and spots on the forewing.

Localities.—Basra, March 1917. (Broughton). Baghdad, Nov. 1920.

Ranges from N. and W. Africa, through Arabia, Persia, to India Burma and Ceylon. Usually found about the thorny bushes of its food plant *Zizyphus*

jujuba which, as Capt. Buxton remarks regarding this form in Algeria (Entomologists Record, Vol. XXVI), is a perfect terror to one's net. The net once caught on a bush seems to embrace it, and only very careful, patient picking off of every part of the net will save it from rents.

T. mediterraneæ, B. Baker, distinguished by the genitalia, common at Baghdad in September and at Amara in June on Zizyphus trees.

Dr. Chapman and Capt. P. A. Buxton, R.A.M.C., have recently contributed an interesting illustrated article on the life history of this race, which is common at Amara, in the "Entomolgist's Monthly Magazine" 3rd series, Vol. V, p. 163

T. balcanicus areshanus, B. Baker, Amara, April and Baghdad September. The locality of the type specimen is Geok Tepe in Transcaucasia near Elizabetpol, and not the more famous place of the same name in Transcaspia. Also obtained at Suleimanyeh in September.

Subfam. THECLINÆ.

Genus APHNAEUS.

A. epargyros marginalis, Riley A. & M. N. H., Vol. 8, p. 598.

N. W. Persia, Paitak, 6-7th August 1918. Suleimanyeh, Kurdistan 1st September 1919; 4 ♂, 9 ♀ (all except 3 ♀ are now in B. M.).

On willows by a stream at Paitak, 2,500 ft. at the foot of the Takigerra Pass. A few, in very worn condition, by the Kalisan stream at Suleimanyeh. Capt. Riley notes on these:—

"Differs from typical *epargyros* (as represented in the B. M. by 13 ♂, 8 ♀ from Persia, Turkestan, etc.) which was described from the Aral Sea region, by its much smaller size, darker ground colour, and the great increase in the size of the black markings above. The submarginal band of the forewing extends to the marginal line, thus forming a broad band which posteriorly joins the median transverse band. The triangular patch of ground-colour so enclosed is nearly half filled by the four black spots between vein 4 and the costa. The black markings of hindwing are correspondingly larger.

On the underside the ground colour is greenish grey, not silver-grey as in typical *epargyros*, and the irregular blotches which in *epargyros* are ochreous, are similarly slightly greenish. The blotches themselves are more rounded, neater and the whole underside has a more delicate appearance than it has in the typical form."

B. M. Types No. Rh. 183 ♂; 184 ♀, Paitak, 6th August 1918.

N.B.—Since its description by Eversmann (1854) *epargyros* has always been regarded as a synonym of *acamas*, Klug. A reference, however, to the original descriptions and figures clearly shows the distinguishing features of the two species. *Acamas* always has the base of the forewing as far as the origin of vein 2, and usually also the whole, or greater part, of proximal half of hindwing grey. In *epargyros* the yellow ground colour extends right up to the base of the wing. In *epargyros* any light yellow area in the forewing is confined to area 6; in *acamas* the lighter areas are sometimes white and may extend into the cell and into areas 5 and 4. But the readiest means of separating the two species is by the shape of the submarginal band of the forewing below. In *acamas* this is an even band (or comparatively so) with a straight inner edge, or bordered by a series of narrow straight lines; in *epargyros*, as stated very clearly by Eversmann, it is made up of a series of very decided crescents, their convex sides inwards.

A., acamas subsp. **hypargyros**, Butler.

N. W. Persia, Harir, 9-19th August 1918; 11 ♂, 4 ♀ (all except 5 ♂ are now in B. M.)

Common among rocks and boulders, and some at mint-flowers, in Harir Gorge 5,400 ft. Capt. Riley notes :—

"Typical *acamas*, described from 'Syria and Arabia' is a brighter insect with much less heavy black markings of upperside, and the markings of the underside cloudier in appearance than in *hypargyros*. It has a softer general appearance, Swinhoe's figures in Lep. Ind. 8, are misleading. Fig. 1 and 1b are from a ♂ of *epargyros* from Persia. Fig. 1a is a ♀ *acamas hypargyros* from Chaman. Both specimens are in the British Museum. Typical *acamas* does not appear to occur east of the Euphrates."

GENUS CIGARITIS.

C. maxima, Stud. Seitz, Vol. 1, p. 279.

Harir, 15th July to 9th August 1918; 2 ♂, 3 ♀ (now in B. M.)

Taken about open ground near stream; the date being apparently late for this species. Taken also by Aldworth at Suwarra, above Mosul, July 1919.

Capt. Riley remarks :—"*Maxima* is usually considered a var. of *cilissa*. I consider it a good species. The general pattern of underside in each is similar, but there are small and constant differences."

N.B.—Type of *Aphnœus* is African and differs morphologically from the so called *Aphnœus* of India, &c.

GENUS ZEPHYRUS.

Z. quercus, longicauda, Riley. A. & M. N. H., Vol. 8, p. 599, and see Plate, Fig. 5·6.

Karind Gorge, 13-17th July 1918; 24 ♂, 25 ♀ (12 pairs now in B. M. collection).

Paitak, 7th August 1918, 1 ♂.

Harir, 20th August 1918, 1 ♀.

Suwarra (ex Aldworth), 1 ♂, 1 ♀ (=ab. *bellus*), early July 1919.

Capt. Riley's note on these runs :—"A well marked local race. It is distinguished from the typical European *quercus* by its generally rather larger size, the brighter and more brilliant colour of the upperside of the male, and the great increase in the length of the tails. These measure 3-4 mm. consistently against 1-2 mm. in European specimens. On the underside the general colouration is much lighter grey, the transverse white bands much straighter; the submarginal markings on the forewing, with the exception of those in areas 1b and 2 which are large, dark and prominent, are almost absent. The anal lobe of the hindwing much larger than in typical *quercus* and the black spot which covers it consequently at least twice the size of that in *quercus*.

Three males and two females, one of the latter a beautiful example of ab. *bellus*, Gerh., taken at Suwarra, Kurdistan, 4,300 ft. in early July 1919, and one male from Lekkoran, 30th June 1914, (ex. Christoph. collection) all of which are in the B. M. are also referable to this *longicauda*. Although the males lack the brilliance of upperside colouration characteristic of typical *longicauda*, in this respect more resembling normal *quercus*, in all other points they agree with *longicauda*."

B. M. Types No. Rh. 185 ♂; 186 ♀, 16th July 1918, Karind Gorge.

This form was common settled in considerable numbers on the upper and undersides of leaves, sometimes more than one on a leaf, of mulberry

at Karind Gorge (6,000 ft.) in very fresh condition on 13th July, the fruit on the tree being then not yet ripe. One taken 7th August at Paitak 2,500 ft. and another at flowering mint on 19th August at Harir 5,300 ft.

GENUS STRYMON.

S. abdominalis, Gerhardi, f. gerhard, Staud. Seitz, Vol. 1, 73 c. see plate Figs. 3 4.

3 ♀, 13-17th July 1918 (now in B. M.) Karind Gorge, 6,000 ft.

Capt. Riley notes :—" *S. abdominalis*, Gerh, is usually regarded as a form of *S. acaciæ*, Fab. The two forms occur together over a wide range, extending from Asia Minor to Persia, and throughout are easily separable, the most conspicuous difference being afforded by the dark spots at anal angle of forewing underside. These are invariably absent in *acaciæ* and just as invariably present in *abdominalis*.

One specimen taken flying about a small tree about 8 feet from the ground, another near the ground, at the border of a wood."

S. ilicis caudatula, Zell. Seitz, Vol. 1·736.

1 ♀, Karind Gorge, 14th July 1918.

Not previously recorded from Persia, the nearest record being Lenkoran (S. E. Transcaucasus).

S. marcidus, Riley. A. & M. N. H., Vol. 8., p. 600, See plate Fig. 20.

1 ♀, Harir 15 July 1918, 5,300 ft. type.

1 ♀, Karind Gorge 16th July 1918, 6,000 ft. co-type. Both now in B. M.

Capt. N. D. Riley's description is as follows :—

♀ *Upperside, both wings.*—Dark brown, immaculate, a fine anticiliary line more conspicuous on the hindwings, fringes whitish, especially on hindwings.

Hindwing.—Anal lobe yellowish, and some yellowish scaling close to margin in areas 1b and 2.

Underside, both wings.—Pale yellowish grey, fringes of same colour, preceded by a very fine darker marginal line which is separated from a very indistinct submarginal shadowy dusky band by only a narrow white line.

Forewing.—A band of white linear spots runs from costa to vein 1, the spots being limited by the veins and inwardly margined with black, the band following almost exactly the curve of the hindmargin. The lowest spot (in area 1b) is characteristic, being crescentic, the concave side facing outward, and as fully developed as the other spots in the series.

Hindwing.—The transverse white band is similar to that of forewing but slightly broader and less interrupted, follows almost exactly the curve of the hindmargin, and in areas 1c, 2 and 3 is composed of V shaped spots the apex directed inwardly. There is a submarginal series of spots, of which that in area 2 is large and black, inwardly bordered with yellow, black then white ; those in areas 3, 4 and 5 small black, ringed with paler, diminishing in size so that the one in area 5 is barely traceable. Anal lobe black with some whitish and yellowish scaling above it, which merges into the last spot of the transverse white band. Between anal lobe and large spot in area 2 black and bluish grey scaling (the exact nature of this area cannot definitely be stated, as the bulk of it is in both specimens completely missing).

Length of forewing, 16 mm. B. M. Type, No. Rh. 187.

Comes near *S. abdominalis*, but the different contour of the transverse band of underside and the absence of the dark marks at anal angle of forewing beneath readily separate it from that.

HESPERIIDÆ.

Genus CARCHARODUS, Hbn.

C. alceæ, Esp. (=**malvarum**, Hoff. **malvæ**, F. Hb. Bdv). Seitz. 1 85a. Kane XV. fig. 1. 40 ♂, 29 ♀ (25 ♂, 26 ♀, now in B. M.)

Varies in colour. Warm brown dappled with sepia, and having transparent white marks. Wings and margin of same chequered with brown and white dentations. In the hottest months some examples are of a pale reddish colour. A sandy brown female, taken July 11th, 1919, at Kizil Robat, is unlike any already at the Brit. Mus.; a second similar example was taken.

Of the 69 specimens above mentioned, Capt. Riley notes :—

"I cannot agree with LeCerf in regarding *swinhœi* as a distinct species. The type (and a considerable series from type locality) is in the B. M. and does not shew the peculiarities which he attributes to it and on which he separates it from *alceæ*. As a local race it is probably justifiable enough. His ab. *isolatrix*, judging by the long series obtained by Lt.-Col. Peile, would appear to be an extreme dry season form. Four ♂ and some 10 ♀ all taken during June and July are of this form, though only one ♀ is so extremely pale as the specimen figured by LeCerf.

January and February specimens are as dark as the normal European ones, and it is very instructive to note how the species get gradually paler during April-May till the extreme is reached in June and July, after which they gradually darken again. It is almost possible to tell the month of capture from the colouration of the specimen."

Localities.—Mesopotamia: Jebel Hamrin, R. Dyala, June. Kizil Robat (Mirjana), Feb., April, May, June, July. Khanikin, October. Baghdad, August, October, November. N. Persia: Harir, Karind Gorge, Kermanshah, very common. (Broughton), Qasvin, July; Baghdad, September-October (Buxton). S. Kurdistan: Suleimanyeh, September. Widespread and abundant in Europe, also Baluchistan, Kashmir and Chitral.

C. altheæ bœticus, Rambur. Seitz, Vol. 1, 85 a.

Harir, 10th August 1918, 1 ♂.

Genus GEGENES, Hbn.

G. nostrodamus, Fab. Seitz. 1. 88 e.

Smoky black, unspotted; female with yellowish marks on discoidal cell of forewing. 15 ♂, 6 ♀ (9 ♂, 5 ♂ now in B. M.), Baghdad, Jebel Hamrin (Dyala).

Localities—Mesopotamia: Kizil Robat, May; Khanikin, October. Range; S. Europe, W. & C. Asia.

G. lefebvrei. Rambur. Seitz, Vol. 1, p. 349.

One male, Kirkuk, 18th October 1919.

It is questionable whether this is specifically distinct from, or only a form of *G. nostrodamus*, Fabr.

Genus THYMELICUS

T. lineola, Ochs. Seitz. Vol. 1·87 f.

Pale reddish yellow; wings narrowly bordered with black, a short stigma on the forewing in males. Mosul, April, one female (Watney). Range: Europe, N. and W. C. Asia, N. Africa.

Is very like 'The small skipper.'

GENUS HESPERIA, Latr.

H. geron, Watson, Seitz. Vol. 1·85 d.

Brown with numerous white spots. Exp. 1 to 1·25 in Kane XV. 11. Described from Quetta, but the name was a M. S. one of Zellers' who had it from Shahrud in N. Persia. 3 ♀, 2 ♀ (now in B. M.) and 1 ♂, 1 ♀.

Localities.—Mesopotamia: Kizil Robat, May. S. Kurdistan, Suleimanyeh, September. N. Persia, Kermanshah (Broughton). Range: Baluchistan to N. Persia; also Turkey and Greece.

H. proto, Esp. Seitz Vol. 1·85 d. Kane Pl. XV. 4. Brown, basal half of wings covered with yellowish fur and having dull yellowish spots and margin. with serrated pattern on margin of hindwing. 3♂, 6♀ (now in B. M.) and 2♂.

Localities.—Mirjana (= Kizil Robat), May, November. Khankin, October Also in Europe. N. W. Persia, Takigerra Pass, Harir.

H. alveus, Hbn. Seitz, Vol. 1, 85 b.

Kermanshah, 24th August 1918, 1 ♀.

H. orbifer, hilaris, Staud. Seitz, Vol. 1 p. 336.

Harir, Karind Gorge and Kermanshah, 12-24th August 1918, 6 ♂, 2 ♀ (now in B. M.) and another ♂.

H. orbifer, Hüb.

One specimen, Qasvin, September (Buxton).

GENUS PARNARA.

P. mathias, Fab. Seitz, Vol. 1, 88 f. g.

Kizil Robat and Baghdad, July, September, November, 3♂, 2 ♀ (now in B. M.) common at Amara, June to November and bred in November on great millet (*Gorghum vulgare*); 10 days in pupa. It is not a pest. Noticed sleeping on the upper surface of apricot leaves just before sun down (Buxton).

GENUS EOGENES.

E. alcides, H. S., Seitz, Vol. 1, 88 e.

Suleimanyeh, September 1st, 3 ♂

Paitak, 1 ♂ August 1918 (now in B. M.).

GENUS THANAOS.

T. marloyi, Bdv. Seitz, Vol. 1, 86 d.

Harir, 16th August 1918, 1 ♂ Common in sheltered spots amongst bare rocky hills at Menzil at end of March.

Thanaos tages, var. **unicolor,** Freyer. Seitz, Vol. 1, 86 c.

Suwarra, one male (Capt. Aldworth).

Note.—Captain Stoneham's records of *Vanessa io* and *urticæ* and of *Pontia chloridice* are now considered incorrect.

The reproduction of the plate by Messrs. Bale Sons and Danielsson is excellent.

For Map of this region see. Vol. XXVII, No. 2, p. 322.

ON INDIAN PARASITIC FLIES.

BY

HAROLD RUSSELL, F.L.S., F.Z.S.

I

This paper is concerned with parasitism among Diptera and particularly among Indian flies. Of the dozen or thirteen families of two-winged flies, in which parasitic habits have been developed, all but one are represented in the insect fauna of India. In some cases it is the larva, in others the perfect or winged insect, which is a parasite. There are also cases of wingless flies, which pass the whole of their existence on the bodies of the hosts from which they draw their nourishment. By no means all blood-sucking flies are parasites; for parasitism, in the strict sense, implies that a host is essential to the well-being and development of the parasite. On the other hand all Diptera which are parasitic in the imaginal, or final, stage of their lives, are blood-suckers. When the respective life-histories of an Œstrid and a Hippoboscid fly are contrasted, it will be seen how entirely larval parasitism differs from imaginal parasitism and what adaptations have been developed to secure the well-being of the larva and the perfect insect, respectively.

By way of preface some generalities on two-winged flies are necessary to render intelligible what follows on the parasitic species. The Diptera are physiologically among the highest insects; none get through their life-history more rapidly; and no insects go through such a complete metamorphosis as flies. In the Muscid flies we have the most highly specialised imago and the most degraded larva known in any group of insects. The larvæ are usually called grubs or maggots. Thoracic legs are always absent; but many larvæ have pseudopods by which they move about with great facility.

Diptera may at once be recognised by the presence of only one pair of wings. The second or hind pair are represented by poisers or balancers called *halteres*, which are small organs consisting of a stem and a knob. The halteres are, obviously, homologous with wings; and in the parasitic wingless forms they usually disappear along with the wings. They vibrate during flight, and besides acting as balancers, they also serve as sense organs. The basal part is supposed to contain a structure which allows sound to be perceived. The wing veins, which are of great taxonomic importance, are comparatively few and for the most part run longitudinally. If the halteres represent wings, it is remarkable that no organs intermediate between the two should be found in any Dipteron. The thorax is welded into a single mass instead of being composed of three clearly divided segments. The legs are characterised by five-jointed tarsi and are often long and slender. In the purely parasitic *Hippoboscidæ* they tend to become shorter but exceedingly stout. The foot of a fly is composed of a

pair of claws and a pair of pads between them. The claws may be extremely slender but in parasitic flies they tend to become strong and serrated.

The antennæ of flies show much variety and have, since the days of Latreille (1802), been regarded as furnishing fundamental characters for classification. They are of two types. The primitive type of antenna is *Nematocerous* (which means long-horned) and consists of a number of nearly similar joints. The *Brachycerous* (or short-horned) type appears to consist of only three joints dissimilar from one another. On closer examination the last is seen to be more or less distinctly ringed and to be made up of several joints. The complex antenna of the most highly specialised flies has, in fact, been evolved from the simple Nematocerous antenna by a concentration of the basal joints and an elongation of the distal. In the parasitic flies this latter type of antenna is very much reduced. Sometimes only a single joint with a few bristles is recognisable ; and this is sunk in a deep pit on the head from which it can be protruded by the contraction of the muscles at the base.

This is no place to enter into the controversies that have raged around the homologies of the dipterous mouth parts. The fly's mouth is adapted for sucking and, sometimes, for piercing and sucking. The mouth parts project beyond the head and form a more or less cylindrical proboscis. In some of the parasitic Hippoboscid flies the proboscis can be almost completely withdrawn within the head. Whilst in the Œstrid flies, in which the larva is parasitic and the perfect insect does not feed, the mouth parts are rudimentary or absent. In all typical flies the proboscis is formed of the *labium*, or lower lip which encloses and sheaths the other parts, which may be variously modified and some of which may be absent.

The reader, who knows anything of entomology, need only be reminded that the order Diptera is divided into two large groups or sub-orders the *Orthorrhapha* and *Cyclorrhapha*. The main difference between these two groups turns upon the manner in which the insect emerges from the pupal envelope. In the *Orthorrhapha* the pupa is mummy-like and shows, in outline, the parts of the future imago which escapes by splitting the skin down the back. In the *Cyclorrhapha* the pupa is like a small barrel, showing only rings outside and nothing of the future imago within. The fly emerges by pushing off a circular cap. The group of flies known as *Pupipara*, because the larva is retained within the mother's body and there nourished until it is ready to pupate, are Cyclorrhaphous flies much modified by parasitism.

The connection that, apparently, exists between development of squamæ or tegulæ and parasitic habits deserves attention. It seems to be chiefly those groups containing a large proportion of entoparasitic species that are provided with tegullæ ; and it is possible that

an acuter sense of hearing is necessary to those forms in their search for hosts. The *Cyrtidæ* for instance are a group which have developed extremely large tegulæ which conceal the halteres and are probably accessory to a highly developed auditory sense. In Diptera auditory organs are placed at the base of the wings and may well be sensitive to air-waves which make no impression on our ears. The halteres in Diptera are supplied by nerves only second to the optic nerves which are the largest in the insect's body. The tegulæ of Diptera are very possibly functional in collecting sound waves and increasing the perceptive power of the organs in the halteres. It seems safe to assume that in those dipterous groups which have no tegulæ, the halteres chiefly perform a function of equilibration ; but in those groups which have highly developed tegulæ such as *Cyrtidæ*, *Tachinidæ* and most *Œstridæ*, the halteres are mainly organs of hearing. So the presence of large well-developed tegulæ in the parasitic flies indicates the presence of a highly developed auditory sense in the halteres. The tegulæ, if this view is correct, are analogous with the cartilaginous external ears of mammals.

Between 40,000 and 50,000 species of Diptera have been described and these have been distributed by modern systematists into about 60 families. The life histories of the parasites are among the most amazing things in Nature. Diptera are not popular insects even among entomologists. Beelzebub in Hebrew is the Prince of Flies but protects his votaries from the molestations of these pests. If this paper should induce one person in India to become a collector of Diptera or, better still, an investigator of their life histories, about many of which nothing is known, it will not have been written in vain.

It will be convenient to show in the form of a table the families of Diptera in which parasitic habits have been developed.

DIPTERA.

I. *Orthorrhapha.*		
Nematocera ..	None are parasitic.	
Brachycera ..	*Bombyliidæ Cyrtidæ = Acroceridæ*	Larval parasitism.
II. *Cyclorrhapha.*		
Aschiza ..	*Phoridæ*	Larval parasitism in many members of these groups.
,, ..	*Pipunculidæ* ..	
Schizophora ..	*Conopidæ*	
,, ..	*Tachinidæ*	
,, ..	*Dexiidæ*	
,, ..	*Muscidæ*	
,, ..	*Sarcophagidæ* ..	
,, ..	*Œstridæ*	

Section Pupipara. ..	*Hippoboscidæ* ..	Imago parasitic.
	Streblidæ	
	Nycteribiidæ ..	
	(*Braulidæ*)	

Various considerations, interesting to the student of parasites, will occur to the reader who thinks over the facts disclosed by this table. In the first place it will be noted that parasitism is far more prevalent in the *Cyclorrhapha* than in the more primitive *Orthorrhapha*. Indeed in the Nematocerous division, which includes the most primitive flies known, there are no parasitic species at all; and in the Brachycerous division only two families, neither of which are very large ones. This absence of parasites from the primitive groups of Diptera is confirmation of Metchinkoff's dictum: that among parasites we are to look for the latest products of evolution.

In the second place, it will be noted that parasitic *larvae* and parasitic *imagines* are sharply contrasted and separated. Only in the Pupipara do we find adult flies parasitic on mammals and birds. Larval parasitism is far more widely spread. The nourishment of the individual and the reproduction of the species is the aim and end of all animals. In insects the larval stage is the period of feeding and of growth; the imaginal stage is the period of love and procreation. Now parasitism is ultimately a matter of securing nourishment. The parasite solves the problem of nutrition, but is often confronted with difficulties when the problem of reproduction has to be faced. This explains why in Diptera, to deal only with the one order under review, the feeding-stage, rather than the reproductive, should more commonly be the parasitic stage. It is an advantage to a larval fly to be well supplied with food and, as an incident, to be a parasite. It is equally an advantage to a mature fly to be free living, and to move about seeking the other sex or depositing eggs. The breeding habits of the Pupipara, which do not lay eggs and nourish the larva within the maternal abdomen, enable the mature fly to enjoy the advantages of a parasitic life. There is no free larval stage to be considered; but against this, nourishment for the adult fly is essential, for without it the young could not be reared. As a result the adult fly is parasitic.

There are other reasons why the larval stage should be parasitic. The habits of Diptera easily pass over into parasitism; but this involves some changes in the way of life which probably come more easily at an immature stage, whilst development and growth are in progress. The greater number of dipterous larvae are vegetable feeders, but many live on decomposing animal matter. From this it is but a step to live and feed in and on the living bodies of other insects or snails, reptiles, birds and mammals. For obvious reasons no dipterous larva is known to be parasitic in a fish. The

dipterous larva, whether free or a parasite, always finds itself among rich supplies of food. For this it must thank its mother who has had a wonderful instinct and in some cases the needful specially adapted ovipositor. This explains why in the Diptera, particularly those in which the larva is parasitic, we find perfect instinct and perfect structure in the imago coupled with comparative degradation in the larva. Hence also arises the vast transformation which takes place at the pupal stage.

II

I propose now to give some account of the structure and life-history of the species which compose the families with parasitic larvae. It will be possible to take a survey of the varieties of hosts that are attacked, of the adaptations which these Dipterous families have evolved in connection with their parasitic habits, and of the most common representations of each family in India. The *Pupipara* will best be treated as a group by themselves; though some entomologists regard the group as polyphyletic and none are agreed what value should be accorded to it. The families which compose the *Pupipara* have little in common except habits. Two of the families are parasites of bats and therefore unfamiliar to most people but to the lover of parasites much the most interesting of all Diptera. In the preceding table I have enclosed *Braulidae* in brackets because the pupiparous habits of the single species are doubtful. It is a minute insect found clinging to bees and not recorded from India.

Bombyliidæ. These conspicuous flies are members of a large cosmopolitan family and may be recognised by their habit of remaining poised for some minutes in the air and then darting away. All are lovers of sunshine and many are frequenters of arid, sandy places. They are familiar features in the Indian plains.* Many attain considerable size and some are gorgeously coloured and coated with fur. The wings are often prettily marked. This family contains many of the most brilliantly coloured Diptera. The abdomen in the subfamily *Bombyliinæ* is almost globular and clothed with a dense furry pubescence like a bumble-bee. The adult flies frequent flowers and feed on honey and pollen. The larvæ feed parasitically on the larvæ of other insects, in some cases Lepidoptera and Hymenoptera, in others on Diptera (Tachinids) which are themselves parasitic on lepidopterous larvæ. The female fly is not provided with any specially adapted ovipositor for placing the eggs which are dropped from above haphazard in the vicinity of the larval host. The Bombyliid larva is amphineustic and cylindrical, with thirteen segments.

* A description of the Indian genera and species will be found in the recent (1920) volume of "The Fauna of British India" *Diptera Brachycera*, by E. Brunetti, Vol. I pp. 173-295.

It has a small retractile head with well-developed mouthparts, papillate antennae and no eyes. When full fed it pupates where it lies and turns into a mummy-like pupa often with strong spines on the head and anterior parts. These spines are appliances developed in connection with the larva's parasitic life to enable the imago to reach the open air.

Most of what is known as to the parasitic habits of these flies we owe to the French entomologist Fabre. *Argyramœba* Sch. is a widely distributed genus with thirteen India species. Fabre's account relates to *A. trifasciata* Mg. which is parasitic on larval masonbees. These bees (*Chalicodoma*) make mud nests on walls and roofs. The parent Bombyliid drops an egg on the nest whilst hovering over it. From this an extremely minute and slender larva is hatched. For a fortnight it remains quiescent and fasting. Then it shows unexpected endurance for one that has fasted so long and amazing pertinacity in seeking a way into the chamber where the larva mason-bee is lying. The Bombyliid larva has a deflexed horny head with stiff bristles. Four pairs of long setae serve as organs of locomotion. By dint of searching it discovers some crack in the masonry through whch it can insinuate its small body. Fabre likens this persistence to the root of a plant working its way through a wall to seek nourishment. This primary form of the larva enables the parasite to reach its victim. Once within reach of food it grows, becomes obese and the setae disappear. The parasite feeds on the host, without killing it, by applying a delicate sucker-like mouth to different parts of the body in turn. At the end of 12 or 15 days the parasite is full grown and the host is reduced to an empty shell. For some months the larva remains quiescent and in the following spring it pupates. Then comes the crisis, for the Bombyliid fly must reach the outer world. Neither the larva, nor the imago has organs capable of doing the work of excavation which is needed and the haircrack which admitted the fasting larva will not permit an exit to the full-fed animal. The Bombyliid pupa, however, has the necessary appliances: (*a*) on the anterior part, spines (*b*) on the middle segments, rigid hairs directed backwards (*c*) on the posterior part, horns. The pupa as a whole is curved into a crescent; and having fixed itself in a firm position by the posterior horns it digs a gallery, by which it can escape, using the head-spines as picks. The pupal skin bursts when an exit has been effected; the fly emerges leaving the skin sticking in the mouth of the gallery.

Bombylius L. is a large genus with a world-wide distribution. This genus is parasitic on small bees (*Andrena* and *Halictus* and others) which live in colonies in sand banks. From India ten species have been collected. *B. major* L. is not at all uncommon on the Simla hills and *B. orientalis* Macq. is found all over India. *B. major* has

been observed to jerk its eggs against a sand bank, from the distance of an inch or more yet strangely enough not so as to drop them actually into the burrow of any bee.* The larvae are of Hymenopterous aspect but there is no mistaking the Dipterous head. The pupa has most remarkable cephalic spines which act as digging organs. There are five prongs on the ventral surface of the head which have been likened to the tusks of a walrus. No part of the imago is formed in these spines and they serve, when the time for emergence comes, to tear down the clay stopping with which the bees close their burrows. Without such tools for digging a way out of the earth, the parasitic larva would have lived in vain.

This family is represented by a hundred described species in India. *Anthrax* Scop., *Exoprosopa* Macq. and *Hyperalonia* Rond. are the largest genera besides those mentioned already. In many cases the life-history is unknown. *Geron argentifrons* Brun. is parasitic on caterpillars found under the bark of the Sissoo-tree (*Dalbergia sissoo*). The pupa of a species of *Systropus* Wied. has been found inside the cocoons of a moth. At one end of the moth's cocoon is a circular piece which is easily removed and allows the perfect insect to escape. The pupal *Systropus* has a strong frontal projection apparently used for the purpose of forcing off this lid. When one considers the difficulties which meet the emerging Bombyliid fly, especially when masonry or clay-stopping has to be penetrated, one cannot but wonder what percentage fail to get out and to perform their reproductive work.

Cyrtidæ. This is quite a small family of rather small flies with curious habits and often an unusual appearance. They are sometimes called *Acroceridæ* but the former name is used by the best authorities whose judgment I follow. The range of the family is world-wide but only some 200 species are named and of these 10 have been collected in India, *Oncodes*, Latr. being the most important genus in that region.* The family is allied to the *Bombyliidæ*; but whereas the latter are parasitic on insect larvae, all the *Cyrtidæ*, whose metamorphoses and life-histories are known, have larvae which are parasitic in the abdomens or in the egg-cocoons of spiders. The perfect insects are like caricatures of *Bombylius* with a head that seems to consist of nothing but enormous globular eyes, a humped thorax and a rounded, sometimes actually globular, abdomen. The mouth-parts are so varied that one can draw no conclusion as to the food that is taken if any. In *Acrocera*, there is a long slender proboscis but in *Oncodes*, the proboscis is apparently absent and there is no orifice into the mouth so that all the feeding must be done during

* Chapman "On the economy of *Bombylius*." Ent. Mo. Mag ((1878) Vol. 14, p. 196.

For the Indian genera and species see "Fauna of British India." *Diptera Brachycera* by E. Brunnetti, Vol 1, which appeared in May 1920.

the larval stage which to the parasitologist is the interesting stage. The eggs are laid by the flies on the stems of plants and when the young larvae emerge they must reach a spider. It is perhaps for this purpose, that they are endowed with unusual leaping powers. They are amphineustic, short, thick, 12-segmented with small head and smaller mouth parts. They burrow into the abdomen of the spider and feed on the tissues. When full fed the larva eats a way out and the dried skins of the spiders are found with a circular orifice clearly showing what has happened. The larva then pupates and the pupa lies in the spider's web until the fly emerges. Not having to dig itself free like the members of the previous family, the Cyrtid pupa has no cephalic spines but on the dorsum of the thorax there is a longitudinal row of spines the use of which is unknown.

One matter in connection with the respiration of the parasitic larva deserves to be mentioned. The hind spiracles are surrounded by large and peculiar plates. Respiration is a matter which must always present a problem for the internal parasite. In one case the Cyrtid larva has been found lying in the abdomen of the host (a spider of the genus *Cteniza*) with the terminal spiracles actually in the lungs of the spider from which it, doubtless, obtained its oxygen. * When the flies emerge from the pupa they frequent flowers and grass. They have rather small wings and no great powers of flight. The halteres are quite concealed by large horizontal squamae which have been previously referred to.

Phoridæ. This is an interesting family of small black and yellow flies with varied and remarkable habits. They have been collected from most parts of the world and are common in India, more so perhaps in the hills than in the plains. They have a hunch-backed appearance, well developed legs and as a rule well developed wings though there are some wingless forms. Most frequently they are to be found about decaying vegetable matter and fallen leaves but sometimes on windows. Little is known about the habits of most species and Brues, the leading authority on the family, has no doubt that much of interest awaits anyone who may undertake to study the varied habits of this group. Brues recognises 23 genera. This is an isolated group whose systematic position is unsettled and Dahl has contended that the *Phoridæ* show affinities with fleas.

To the student of parasitology the larvae are of exceptional interest because some get their nourishment from dead and decomposing

* An interesting account and plates of larvae, etc., will be found in: "Beiträg. zur Biologie der Aeroceriden" (*Cyrtidæ*) by F. Brauer. Verh. Zool-Bot. Ges. Wien (1869) Vol. 19 p. 737. See also the same author's later paper (1883) Denks. Ak. Wiss. Wien, Vol. 47 at p. 26 and p. 61.

Wytsman's "Genera Insectarum": Part 43. *Phoridæ* by C. T. Brues. There is also a Monograph by Theodor Becker Abh. Zool.-Bot. Ges. Wien. (1901) Vol I. Heft 1.

animal matter, but others do so whilst living in or on live animals some as parasites, others as commensals. A study of the habits of allied species as they advance along the road to parasitism ought to throw light on the gradual stages by which the strictest parasitic habits have been evolved. The Phorid larvae are cylindrical and tapering towards the front. All that had then been observed as to life habits and metamorphoses was collected in 1883 by Brauer. * From this it appears that the larvae, as a rule, live in other insects (both living and dead) as well as in almost any sort of decaying organic matter. Certain species show a predeliction for human corpses. It seems established that each individual species of larva is not inseparably bound to any definite host or even to any special sort of nourishment. The most varied habits have been observed in one and the same species. From this it may be inferred that parasitism, where it occurs, is a newly acquired habit. A number of Phorid larvae live in ants nests. *Apocephalus* is a parasite and *Metopina* is commensal. The parasitic larva lives in the head of the adult ant which finally drops off. The commensal larva lives curled about the neck of the larval ant and partakes of the food given by the attendant worker ants. Other Phorids have attached themselves to termites, while others are found in the nests of fossorial bees and wasps. It would be instructive to know what they do and what they feed on in the nests.

Pipunculidæ. This is a small family of rather obscure and minute flies; but they are found in most portions of the globe and there are a number of Indian species which have been very little studied. So far as their habits are known the larvae are always parasitic in the bodies of Rhynchota. The Homopterous leaf-hoppers belonging to the families *Jassidæ* and *Fulgoridæ* are much attacked and also the spittle-insects or *Cercopidæ*. The important genus is *Pipunculus* Latr. with about 80 described species represented in every continent. Verrall considers the family the most exquisite fliers in the order Diptera. They can remain poised, without ever touching the sides in a glass tube not more than half-an-inch across. This power is made use of by the female when laying her eggs on the Homopterous host. She has been observed beating to and fro over the herbage and then, on perceiving the species of insect for which she was searching, hovering motionless like a kestrel and finally pouncing when the position of the victim was favourable.

To assist in this parasitic business the flies have developed at least three sets of interesting features. First come the enormous eyes. The head is nearly spherical, actually broader than the thorax, and composed chiefly of the large eyes. The front facets, which in both

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* Dr. F. Brauer 'Die Zweiflügler des Kais. Museums zu Wien'. Denks. Kais. Ak. Wiss. Wien. (1883) Vol. 47, at p. 66.

sexes are well developed, are enlarged to an enormous extent in the females. The proboscis is concealed and nothing of the head is visible in some species except the antennae and the globular eyes. The head reaches its maximum development among Diptera in this family, and being balanced on a point, a high degree of mobility is attained. It is clear that vision is principally depended on in finding a host for the egg.

Secondly, legs and feet are unusually well developed and strong. The feet are furnished with large laminate pulvilli and slender elongated claws. The fact that in some species they are larger in the female than in the male shows that they are implements to serve the female in her egg-laying; for when she pounces on her victim she graps and holds it, remaining perched upon its back, until her purpose is effected. Lastly, the ovipositor of the female is a noteworthy feature. It is strong and prominent, forming a sharp recurved, piercing-organ. The egg-laying is effected with great rapidity. It seems to be established that some flies will attack different species of leaf-hopper but whether hosts from different families, *e.g.*, *Fulgoridæ* or *Zassidæ* are used by the same Pipunculid species is uncertain. Both adult leaf-hoppers and nymphs are subject to attack.

Out of the egg emerges a small, thick, oval larva which feeds on the living tissues of the host, without killing it, and which may sometimes be seen through the cuticle. The Pipunculid larva ultimately leaves its host, to pupate buried in the soil or attached to a leaf of the tree on which the leaf-hopper fed. Although a shapeless acephalous maggot it is capable of great extension and contraction. By which means, and by rolling movements, it is able to make enough progress to find a place suitable for pupation. When the larva of *Pipunculus* leaves the host it usually escapes at the junction of the thorax and abdomen and this rupture of the leaf-hopper proves fatal to the host.* The pupa is black or brown and of the normal dipterous type. The life history of this interesting family deserves much closer study for we have a dipterous family which in behaviour and habits approaches in several respects the highly specialized parasitic Hymenoptera. Little is known in India of the family as a whole but Brunetti has described some Indian species and the family is one which would well repay collectors.

Conopidæ. This is another comparatively small family but one with a wide geographical distribution. The larvae have a remarkable parasitic career. The adults frequent flowers, fly rather slowly,

* Some details on life history will be found in 'Leaf-Hoppers and their Natural Enemies (Part IV. *Pipunculidæ*) By R. C. L. Perkins, Honolulu 1905. The European *Pipunculidæ* have been monographed by R. Becker, Berliner Ent. Zeitsch. (1897) Vol. 42 p. 25. With an excellent plate of the forms of ovipositor. The larva is described by F. Brauer "Die Zweiflügler des Kaiserl. Mus. zu Wien." Denks Kais. Ak. der Wiss. Wien (1883) Vol. 47 p. 32. All the above works contain references to earlier papers.

and being coloured yellow, red, or black, with a distinct waist and a pubescent abdomen, they have an unusual resemblance to wasps which may be protective. In India they are often to be seen in the hills, but are not so common in the plains. *Conops erythrocephala* with a black abdomen and grey thorax and head is a widely distributed Indian species. Most species are elongated flies of moderate size and the ovipositor of the female is often conspicuous. In some cases it is folded beneath the abdomen, in others not.

The parasitic life of the larva is passed, so far as is known by nearly all species, in the body of adult Hymenoptera, wasps and bees. Occasionally the larvae of this family are parasitic on Orthoptera.* In some cases the Conopid fly has been seen pursuing a wasp or bee and depositing eggs directly on its body during flight. When the larva emerges, it burrows into the abdomen of the bee or other host. It lives within the abdominal cavity of the host and feeds on the least vital parts, lying with its posterior end directed towards the base of the abdomen. It is an oval larva, distinctly segmented, with strongly bent mouth-hooklets at one end, and at the other, on the last segment, two large round stigmatic plates arched like watch-glasses. The larva pupates within the host and remains there during the winter. When the time arrives for the adult fly to emerge, it forces a way out between the abdominal segments. Whether this proves in all cases fatal to the unfortunate bee, appears not to be certainly known.† A number of cases are on record where collectors of *Bombus* and other bees or wasps, on opening the boxes in which their collections were stored have found specimens of *Conopidæ* which emerged sometimes over six months after the killing and pinning of the host.

Regarded as types of parasitic lives, the lives of the larval Conopids are of special interest because they are the first family which are parasitic in the bodies of adult insects. In the previous dipterous families the larvae have been parasitic in the bodies of other larval insects. In the *Conopidæ* the adult Hymenopteron is parasitized by the larval Conopid. Whether the parasite must be more highly specialised successfully to deposit an egg upon an imago as distinguished from a larval host is a matter for consideration. It does not appear to be the case that insects which are highest in the evolutionary grade become parasitic on the higher types of host; and the *Tachinidæ* which come next in the methodus of dipterous parasites are insects whose parasitism is apparently always confined to the early stage of other insects.

(*To be continued.*)

* References to early observers from the time of Latreille (1809) will be found in Brauer's paper (1883) Denks. Kais. Ak. der Wiss. Wien. Vol. 47. p 83.

† Some details on the life-history of a species of a *Conops* which is parasitic on a large *Pompilus* are given by Saunders "Observations on the habits of the Dipterous genus *Conops*." (1858) Trans. Ent. Soc. London N. S. Vol 4. p. 285.

"THE BIRDS OF MESOPOTAMIA."

BY

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PART II

(With 2 plates.)

Continued from page 250 of this Volume.

66. Grey Hypocolius. Hypocolius ampelinus.

Hypocolius ampelinus, Bb. (Consp. Av. I., p. 336, 1850—Abyssinian Coast).

This species is evidently a very local bird in Mesopotamia and its status not satisfactorily cleared up. Some observers did not meet with it at all and others who came across it found it locally common. To Cumming belongs the credit of first describing the nesting habits of this extraordinary bird (Ibis, 1886, p. 479) which were previously unknown, and he supplemented his observations in the B. N. H. S. Journal (12, p. 760); since then nothing has been written about it of any moment. Cumming considered that at Fao it was a summer visitor arriving early in April from the S. E., but Zarudny records that it winters in small numbers in the Karun district, where however it is commoner in the breeding season. Pitman too found it plentiful in the Adhaim river from September 24th up to the time he left there on November 17th, so that it seems certain that some at all events pass the winter in the country.

Buxton, who met with this species at Amara in June, considered it to be a bird of the date palms, which opinion coincides with Cumming's. He describes it as a very sprightly bird, very active and restless, frequenting the young palms and running up and down the stems of the leaves like a Babbler; the black nape feathers can be erected into a small crest under excitement. He describes the flight as long, rapid and straight, 300-400 yards at a time, the tail being held straight behind. Pitman found his colony on the Adhaim frequenting low scrub jungle which on both banks extend for nearly a mile between fairly high cliffs. This scrub, almost impenetrable in places, consisted of acacia, tamarisk, poplar and willow, and the *Hypocolius* invariably preferred the parts containing poplar. Where they occurred they were exceedingly plentiful from September 24th to November 17th; in addition to Buxton's notes on their flight and habits he says "when a flock comes down to a bush they often wheel swiftly several times like a flock of sparrows do, or else they drop head first towards their objective and steady themselves at the end by cocking up their long tails over their backs. They usually keep on the outside of the bushes when

searching for insects, and I have never seen them come down to the ground. They have an unmistakable squeaking note and often a large flock is very noisy and can be heard quite a long way off. I have occasionally found them at dusk roosting on the thorny bushes. The males are very fond of sitting up at the top of a bush, elevating their black crests and jerking their tails up and down, and while creeping about a bush their tails are constantly being moved. When sitting on the alert they are very conspicuous on the tip-tops of a thorny leafless bush, their long bodies held straight up, tails down and head and neck rather stretched up in a position of alertness and attention. Frightened they suddenly wheel off at a tremendous pace, all going off at the same instant. The flocks consist of six to twenty individuals."

Concerning their habits in the breeding season, Cheesman, who found a colony at Sera on the Tigris in scrub jungle, says the pairs often pack into a flock; on settling, their call, actions and appearance were similar to those of a Babbler and pairs often indulge in love flights, flying round 100 to 150 feet up in the air. They were building in the scrub on May 1st and he found a nest in a low bush two feet from the ground in open scrub; the nest, which was being built of coarse grass stems, was in the centre of a bush, not at all hidden, and the birds were not shy. Cumming records that they breed at Fao in the middle of June and he found the first eggs on June 13th; the nests there are placed on the date palm leaves three to five, occasionally ten feet up, and four is the usual number of eggs. He describes the eggs as glossy white with lead-colour blotches and spots towards the large end and at times over the whole egg. Tomlinson on the Karun R. found nests with four and five eggs on May 24th.

Their food consists of "insects" (Pitman), while Ingoldby saw these birds gorging themselves on ripening dates at Baghdad, and Cheesman found gizzards of birds obtained full of the luscious red berries of *Lycium europœum.*

Bare records of this bird were received from Baghdad, near Amara, Museyib and Basra in the breeding season.

The bill is black and the legs flesh colored.

Spirit specimens of adults and newly hatched young are great *desiderata.*

Eleven specimens examined: ♂ ♀, Amara, 24-6-18 (P. A. B.); Baghdad, 7-8-17, 2-10-17 (two) (Ingoldby); ♂, Adhaim, 30-9-17, 9-10-17 (two) (C. R. P.); ♂ ♂ ♀, Sera, 30-4-19 (P. Z. C. and R. E. C.).

67. White-eared Bulbul. Pycnonotus leucotis.

*Pycnonotus leucotis, mesopotamiæ** C. B. Ticehurst (B.N.H.S.J. 26, (p. 279, 1918—Basra). Type now B. M.

This race of Bulbul is common and resident in palm groves and gardens from Fao and Shustar to Baghdad on the Tigris, and to Museyib on the Euphrates; higher up on the two rivers at Samarra, Tekrit, Mosul and at Feluja, Ramadi and Hit their absence was remarked on, as it was at Khanikin on the frontier, which place Buxton visited twice; nor is any Bulbul recorded at Urfa by Weigold. Some of these places are doubtless unsuited to its habits, though others, such as Khanikin, appeared to be suitable in every way. Away from the date palm and garden area it seldom occurs but Pitman found it innabiting reed beds near Kurna far from any trees.

It breeds from April to July; Buxton found young hatched by May 1st when most were yet building, and in September saw partly fledged young, so that probably two or more broods are reared. The middle of May appears to be the time for fresh clutches of eggs. Tomlinson says three, rarely four, is the usual number of eggs and three certainly seems to be the common number, but Cumming at Fao records a nest of five. The nests are situated in almost any bush, especially date palms, and a nest is reported as situated in a reed frame sup-

* By a printer's error spelt *mesopotamia.*

porting melon plants. The nests are small cups, made of fine grass and small twigs, lined with finer grass and date palm fibre with a little "cottony" material.

21 specimens examined: ♂ ♀, Hilla, 16-3-19; ♀, Khazimain, 15-2-19, ♀, 13-11-18; ♂, Basra, 19-4-17 (P. Z. C. and R. E. C.); ♀, Shustar, 20-1-18; (F. M. B.); ♂, Amara, 28-3-18 (P. A. B.); 4 Nahr Umar, 25-3-18 (C. R. P.) ♂ Basra, 20-11-17 *type*; 4♂, 3♀, 17-19--3-18 (C. B. T.).

Ixos leucotis of Gould was described from "In India orientali" (P. Z. S., 1836, p. 6,); here there is nothing to shew whence Gould obtained his specimens but it is known that his son collected in Sind and sent his father specimens; I therefore designate Karachi in Sind as the restricted type locality for the typical race.

In the Bombay Journal (*loc. cit.*) I described the Bulbul of Mesopotamia as a new race of the Indian bird, characterized by its rather longer wing and tail and larger bill, the yellow rim round the eyelids and rather darker underparts. I described it from a series obtained in Basra and these birds had markedly dark underparts. I have since seen more of these Bulbuls from elsewhere in Mesopotamia and I am not sure that this last character holds *so markedly* as I at first thought. I find all birds from Basra are darker than from elsewhere in Mesopotamia, and I think it is due to grime from the many steamers which anchored there during the war. I particularly noticed it to be the case with the *Prinia* and *Francolinus*.

The other characters however hold good, *viz.*, yellow eye rim, longer wing and tail, and larger bill. Hartert (Vog. P. Fauna, p. 462) gives measurements of *leucotis* as wing 91-94, tail 86-92 mm. A number of Sind males however measure: wing 83-88, tail 80-89 m.m.

Pitman records that on May 25th near Feluja where this Bulbul does not occur. he saw a pair of Bulbuls which had no white on the cheeks and whose general colour was dull smokey brown. Possibly *P. capensis xanthopygos* occurs here and in some other parts, but the question requires further investigation before this, the Palestine Bulbul, can be admitted to the fauna.

68. Spotted Flycatcher. Muscicapa grisola.

(1) *Muscicapa grisola grisola*, L. (Syst. Nat. Ed. 12, 1, p. 328, 1766—Europe).

(2) *Muscicapa grisola neumanni*, Poche (Orn. Monats., 1904, p. 26, N. W. Massailand).

The Spotted Flycatcher is a passage migrant in fair numbers, arriving rather late in spring; the first may be looked for about the middle of April and they are numerous later in the month; some are found throughout May, and Buxton noted them at Amara until the second week in June, but there was no indication of their breeding there. The return passage begins about September 10th and they are common all the month. Buxton found them still common at Amara on October 25th, but they soon after disappeared. During their passages they are widely distributed throughout the region.

Weigold, who found the species common on spring passage at Urfa (April 15th—30th) is inclined to think his specimens belong to the Eastern form *neumanni*.

(1) Twelve skins examined: ♂, Amara, 27-5-18 (two); ♂ ♀, 9-9-18, ♂ 4-10-17 (P. A. B.); Tekrit, 17-4-19; S. Saad, 16-91-7; Shaiba, 23-9-16 (P. Z. C. and R. E. C.); Basra, 1918 (Hobkirk).

All these are the paler *neumanni*, which probably, is the commoner of the two races. It nests in small numbers as near as the Zagros (Zarudny).

(2) 2, Feluja, 8-5-17 (C. R. P.); Basra, 5-5-17 (L. Home).

These belong to the typical European race. It is interesting to note that these were all got about the same day and perhaps represented a wave of migration of this race.

69. Pied Flycatcher Muscicapa atricapilla.

(1) *Muscicapa atricapilla atricapilla*, L. (Syst. Nat. Ed. 12, p. 326—1766, —Sweden).

(2) *Muscicapa atricapilla semitorquata*, Hom. (Zeit. ges. Orn. 2, p. 185, 1885—Caucasus).

(1) Noted by Weigold at Urfa on April 15th and fairly common on passage for a few days.

(2) This race arrived at Urfa and passed through before *collaris*. It arrived on April 11th and was common up to 19th.

Buxton saw a Pied Flycatcher of sorts at Baghdad on September 25th and Stoneham records a pair at Samarra on April 10th.

This race must surely occur more numerously in Mesopotamia? I may here record that on March 22nd a male Pied Flycatcher came on board near Tanb Islands in the Persian Gulf and left, going north, when the Persian shore became visible near Bunder Abbas. I had it repeatedly within a few yards of me.

Cumming obtained a male in January 1887 and a female on August 29th, 1886, at Fao. These are in the British Museum and Mr. Kinnear has identified them as belonging to this race.

70. Collared Flycatcher. Muscicapa collaris.

Muscicapa collaris, Bechst. (Gem. Naturg. Deutschl., 4, p. 495, 1795—Thuringerwald, Central Germany).

The only records of this species are those of Weigold who found it common at Urfa on passage between April 15th and 21st. Its migration route would not seem to pass over middle and lower Mesopotamia.

71. Red-breasted Flycatcher. Muscicapa parva.

Muscicapa parva parva, Bechst. (Latham's allg. Urbers d. Vogel 2, p. 356, 1794—Thuringerwald).

The only record is that of Cumming who got one at Fao on October 10th, 1884.

72. Chiffchaff. Phylloscopus collybita.

(1) *Phylloscopus collybita collybita*, Vieillot. (N. Dict. d'Hist. Nat., 11, 1817, p. 235—France).

(2) *Phylloscopus collybita abietina*, Nilsson (Kgl. Vat-Akad. Handl., 1819, p. 115—Sweden).

(3) *Phylloscopus collybita tristis*, Blyth. (J. A. S. B., 12, 1843, p. 966 —Calcutta).

(4) *Phylloscopus collybita sindianus*, Brooks (Stray Feathers, p. 476, 1880—Sind).

None of the *Phylloscopi* were differentiated in the field and so the various species and races can practically only be dealt with from specimens obtained. The Chiffchaffs are common winter visitors throughout the area in suitable situations such as gardens, crops, scrub, reeds, etc. They appear to arrive late, as the earliest record is of one obtained on October 26th; after that they are fairly common though it seems likely many pass through to winter further south, as a great increase in numbers is noted by several observers in the last week in March on return passage. Cheesman heard them in song at Khazimain on March 16th and Pitman near Basra on March 26th. They move north early in April, the latest date for *collybita* is April 5th and of *abietina* April 22nd.

(1) Judging by the skins received, the typical race is perhaps the commonest and certainly the first two and probably also *tristis* over-winter. Weigold does not record the typical race from Urfa and Zarudny says it is a rare passage migrant in the Karun district, which is somewhat strange both in view of our records and that of Woosnam's, whose skins from that area (February 14th to March 26th) according to Witherby all belong to the typical race.

Photo. Capt. W. Edgar Brown, 5th June, 1916.

A.—Kentish Plover's nest on shelly clay margin of large marsh below Amara. Eggs (3), almost hatching.

Photo. Capt. C. H. Foster.

B.—A salt pan about 3 miles W. of Euphrates barrage. 1.6.17.
Typical breeding ground of Little Ringed Plover, Common Tern, Kentish Plover, Black-bellied Tern, Pratincole, and White-tailed Lapwing. Nest of latter in foreground.

17 skins examined: Amara, 5-4-18, 18-12-17, 13-3-18, ♀, 1-11-17, ♂, 24-3-18; Kumait, 13-11-17 (P. A. B.); Shustar, 4-1-18 (F. M. B.); ♂, Sheik Saad, 24-3-17, 14-12-16; ♂, 14-3-17 (P. Z. C. and R. E. C.); Nahr Umar, 24-3-18; Samarra, 5-2-18, 6-3-18 (two); Feluja, 22-3-17 (two); Shat-al-Adhaim, 15-11-17 (C. R. P.). Wings both sexes 55-62; possibly odd ones of these (unsexed) may belong to the race *abietina*.

(2) Weigold states that this race was the commonest small bird at Urfa from April 10th to 23rd and that all were females, the males having probably passed through. He says his skins are not quite typical (wing 56-58) but on geographical grounds he considers them to be of this race! I can only remark that many females of the typical race are within his measurements and that assuming what you wish to prove does not always lead to accuracy. Zarudny gives it as a winter visitor and passage migrant in the Karun district.

12 skins examined: ♂, Amara, 21-1-18, 12-3-18; Ali Gharbi, 3-3-18 (P. A. B.); ♀, Busra, 22-4-17; ♂, Sheik Saad, 29-3-17; Khazimain, 6-4-19 (two) (P. Z. C. and R. E. C.) Samarra, 3-18, 13-12-17, 5-2-18 (C. R. P.); Basra, ♀, 18-3-18, ♀, 20-11-17 (C. B. T.).

Wings ♂, 63-68·5. ♀, 58-60·5 m.m.

(3) The Siberian Chiffchaff is probably commoner than records indicate; we have two skins only, obtained as follows:— ♂, Amara, 26-10-17 (P. A. B.); ♀, Kazimain, 16-3-19 (P. Z. C. and R. E. C.). Zarudny records it as a winter visitor and Cumming met with it at Fao in March and May.

(4) A Chiffchaff obtained by myself at Basra on November 20th, 1917, I cannot refer to any of these three races. It lacks all green and yellow coloration in the plumage, even the edges of the wings have no greenish wash. This specimen matches pretty well a series of *sindianus* which I obtained in the type locality, except that its bill is a trifle larger than most, and to this race I must refer it. *P. c. sindianus* is very close to *Ph. neglectus lorenzii* which is a rather rare bird and of apparently limited distribution (Caucasus), and this might be expected to occur in Mesopotamia. The coloration of the upper and underparts are precisely the same in both, the only differences I can see are (1) in *sindianus*—the bend of wing, under wing coverts and axillaries are *pale yellow*, not *white* or *isabelline white* as in *lorenzii*; (2) the wing formula is slightly different,—in *sindianus* the second is equal to the ninth, or between this and the eighth or tenth, whereas in *lorenzii* it is equal to the eighth or between this and the seventh. In these characters my Basra bird resembles *sindianus* and not *lorenzii*.

73. Willow Wren. Phylloscopus trochilus.

(1) *Phylloscopus trochilus, trochilus* L. (Syst. Nat. Ed., x., p. 188, 1758—England).
(2) *Phylloscopus trochilus eversmanni*, Bp. (Consp., Av. 1, p. 289, 1850—Kazan and Orenberg in Russia).

The Willow Wrens are spring and autumn passage migrants, both races passing through about the same time. A few arrive in March; Cumming records it on March 17th and there were a few at Basra on the 20th; most however come in the first half of April; they pass through again in September, all our records relating to the last three weeks of the month. Weigold noted numbers of the typical race at Urfa from April 10th to 19th and also obtained two of the eastern race (*eversmanni*) on the 10th. Zarudny lists the latter as a winter visitor!

(1) Four skins examined: ♂, Amara, 17-4-18. ♀, 18-9-18 (P. A. B.); Basra, 19-4-17; Khazimain, 6-4-19 (P. Z. C. and R. E. C.).

(2) Three skins examined: ♂ Amara, 18-9-18, ♀, 18-9-18; Baghdad, 21-9-17 (P. A. B.).

74. Plain Willow Wren. Phylloscopus neglectus.

Phylloscopus neglectus neglectus, Hume (Ibis, 1870, p. 143—Punjab).

Noted by Zarudny as a winter visitor to the Karun district; it breeds according to him in the Zagros in small numbers. It should be fairly common in Mesopotamia, but we have no records of it.

75. Bonelli's Warbler. Phylloscopus bonelli.

Phylloscopus bonelli orientalis, Brehm. (Vogelfang. p. 332, 1855—Wady Halfa).

The Eastern Bonelli's Warbler was met with at Urfa by Weigold during spring migration from April 12th to 22nd; he remarks that it was not common, singly or in pairs.

76. Wood Wren. Phylloscopus sibilatrix.

Phylloscopus sibilatrix sibilatrix, Bechst. (Naturforschev., 27, p. 47, 1793—Thuringan).

Also recorded by Weigold from Urfa as rather uncommon on passage from April 13th to 18th; he remarks that specimens obtained are not paler than German ones. So far we have no records of either of these Warblers.

77. Cetti's Warbler. Cettia cetti.

? *Cettia cetti orientalis*, Trist. (Ibis, 1867, p. 79—Palestine).

The status of this Warbler in Mesopotamia is unknown and the records are few. Buxton heard it near Baghdad on September 17th and again at Amara on November 6th, while he obtained two specimens at the latter place on September 28th and January 9th.

There is a specimen from Fao, November 4th, in the B. M. and Weigold obtained seven males at Urfa between April 12th and 22nd where there were several in the gardens. He thinks his specimens belong to the typical race and gives the wing measurements as 62-68 mm. These Urfa birds appear to me to be much too large for the typical race which usually measure 60-62; he mentions nothing about the colour. These three Mesopotamian birds are too pale for *cetti*, especially on flanks and undertail coverts and match well in this respect Larkhana birds, topo types of *cettioides*, however they are rather small for this, one male 66, and two unsexed 65 and 58. Now five males from Larkhana measure 65.69. 71.71.73 mm.; (perhaps the first is wrongly sexed) and two females 61 and 63-5 mm.; four males from Kohat and Khandahar measure 68·5—72·5 mm., and female 60, so that one may say that usually this race has a wing of 68·5-73 in males and 60—63·5 in females. One would like to see more Mesopotamian specimens but for the present I am inclined to place these under *orientalis* of Tristram whose type came from Palestine rather than under *cettioides*. Palestine specimens seem to be scarce in collections, there is one in the B. M. and one in the Tring Museum; both of these I have examined; they do not seem to me to be distinguishable in colour from Sind birds, but are perhaps a little smaller, wing. ♂. 64·5. ♀57 mm., but until more Palestine specimens can be examined it cannot be considered settled whether *orientalis* is a sufficiently distinguishable race.

78. Moustached Sedge Warbler. Lusciniola melanopogon.

Lusciniola melanopogon mimica, Mad. (1903—Flugblatt, Transcaspia).

Buxton met with this species in the Hor Hawizie, south-east of Amara, on July 13th where it was common in the sedges on the edge of the huge marsh and evidently breeding. He obtained three adults in very worn plumage, the organs of one of which were much enlarged. These skins are so poor that it is impossible to say which race they belong to. However I saw two or three in reedy dykes

at Basra on November 20th and obtained one which undoubtedly belongs to the Eastern race. The above records tend to shew that this bird is resident, but further confirmation is desirable.

79. River Warbler. Locustella fluviatilis.

Locustella fluviatilis, Wolf (Meyer and Wolf's Taschenb. d, deutsch, Vog. 1, p. 229, 1810—R. Don in Austria).

A single specimen was obtained by Venning at Basra on May 11th, 1918 ; it is pretty certain to have been a passage migrant. The occurrence of this species is not unexpected as it occurs in the Ural Range and has been obtained in Asia Minor and Palestine (Hartert. Vog. Pal.)

The Eastern Grasshopper Warbler (*L. n. straminea*) and Savi's Warbler (*L. luscinioides*) may both be expected to occur.

80. Great Reed Warbler. Acrocephalus arundinaceus.

Acrocephalus arundinaceus zarudnyi, Hart. (Bull. B. O. C., 21, p. 26—Djarkent in Turkestan).

The records and notes about Great Reed Warblers are not many and rather confused as the different kinds were not recognized in some cases. It can however be confidently stated that the Eastern Great Reed Warbler is a passage migrant through Mesopotamia in spring and autumn. Pitman noted that the spring passage lasted at Feluja from April 20th to 29th and Buxton records a sudden rush at Amara on May 7th. Cheesman saw two at Sheik Saad as early as April 3rd. Cumming records it as a double passage migrant at Fao. Pitman records the return passage during the first week of September at Baghdad. Odd birds may winter in Mesopotamia as Woosnam obtained one at Ahwaz on February 28th and Zarudny lists it as wintering in the Karun district, as well as being a passage migrant.

There is no evidence so far of its breeding in our area. Buxton, who worked the huge marshes to the east of Amara during the nesting season, failed to see or hear an *Acrocephalus* at all. On passage this bird affects bean and pea rows in the absence of reed beds.

Ten specimens examined : Basra, 31-7-18 ; Sheik Saad, 3-4-17 (two); Baghdad, 31-8-17 (P. Z. C. and R. E. C.) ; Feluja, 21-4-17 (two) ; 29-4-17 (two) (C. R. P) ; ♂ ♀, Amara, 7-5-18 (P. A. B.).

The specimens obtained are certainly too pale on the back, rump and flanks for the typical race and correspond best with *zarudnyi*, which race Weigold also records from Urfa on April 20th.

Zarudny records the Eastern Clamorous Reed Warbler (*Acrocephalus stentoreus brunnescens* as wintering in the Karun district. We have no definite records of it and no specimens were obtained, and in view of the discovery of *Acrocephalus babylonicus* I hesitate to accept Zarudny's record.

81. Babylonian Reed Warbler. Acrocephalus babylonicus.

Acrocephalus babylonicus C. B. Ticehurst (Bull. B. O. C., 253, pp. 12-13, 1920—Basra).

In working out the collection I found some specimens of Reed Warbler which evidently belonged to no known race or species and I described it therefore as new (*supra l. c.*).

We have in Mesopotamia three Reed Warblers at least, *viz.*, the Common Reed Warbler (*Ac. scirpaceus*), a small bird, the Great Reed Warbler (*Ac. arundinaceus zarudnyi*), a large bird, and the Babylonian Reed Warbler (*Ac. babylonicus*) of a somewhat intermediate size. As the field observations refer to the Common and Great Reed Warblers and doubtless include our new species, little of certainty can be said about it. Cheesman obtained the type specimen on April 22nd, 1917, at Basra where he found it among date palms and pomegranate

trees, and says a Reed Warbler of sorts breeds at Basra. Pitman obtained three specimens at Lake Akkarkuf near Baghdad on August 25th where they were not uncommon. Logan Home and Tomlinson found it breeding in the marshes near Basra and sent to Jourdain eight clutches of eggs together with a breeding bird. This specimen is in the Tring Museum labelled *brunnescens*, which it certainly is not. Jourdain who received nests as well as eggs, describes (t. c. p. 14) the former as " comparatively small and slight about 3—3½ inches in depth and about the same in diameter, totally unlike the deep bulky edifices constructed by the Great and Clamorous Reed Warblers. The eggs, three or more (usually four) in number, are also smaller (av. 19·5×14·6mm., 23 measured) and are very variable in colouring, some closely approaching the type of *A. palustris* while others would almost pass for *A. scirpaceus*, and two sets have a pale bluish grey ground and irregular streaks, spots and blotches, chiefly at the large end, of varying depths of sepia and ochreous brown." One clutch was (*Ibis*, 1920, p. 310) erroneously described as unusual varieties of *brunnescens*.

Five specimens examined : ♂, Basra, 22-4-17 (P. Z. C. and R. E. C.) *type of species*.

L. Akkarkuf, 25-8-17 (three) (C. R. P.); Basra, 11-5-19 (L. Home) ex Tring Museum.

This species has the same shaped bill as *stentoreus*, though smaller ; but the wing formula is like that of *arundinaceus*, that is to say the second primary is a little shorter than the third (the longest) and reaches between the third and the fourth. The first primary is minute, 6 mm.,* *shorter* than the longest primary covert. The tail is less rounded than in *stentoreus* or *brunnescens*, the outer feathers being 5-8·5 mm. shorter than the centrals, instead of 14-16 mm., as in *brunnescens*. The third primary only is emarginate on the outer web, unlike *brunnescens* in which the third and fourth are both emarginate. The tail is shorter than in any known race of *arundinaceus* or *stentoreus*, markedly so.

The colour of the upper parts is more olivaceous green than in either of these, and the throat pure white without any obsolete streaks. Underwing and axillaries paler, almost white. The autumn specimens appear to be more rufescent than the spring ones but they are poor specimens.

Iris brown, bill horn colour, tongue bright yellow, legs and feet plumbeous.

Wing 78-83·5, tail 61·5-65, bill from base 19·5-22, tarsus 23·5-24 mm.

Nothing is known about the status of this bird or its habits and distribution ; further observations and specimens are greatly desired.

82. The Common Reed Warbler. Acrocephalus scirpaceus (streperus auct).

(1) *Acrocephalus scirpaceus scirpaceus*, Herm. (Obs. Zool., p. 202, 1804—Alsace).

(2) *Acrocephalus scirpaceus macronyx*, Sev. (Turkest. Jevotn. Moskov., viii, 2, p. 128, 1873—Syr. Daria).

There are no observations practically regarding this bird. Cheesman saw it at Shush on May 2nd and Buxton noted several in a reed bed at Gurmat Ali on August 18th and obtained a specimen ; other specimens were obtained at Amara, April 3rd, Busra, April 22nd, L. Akkarkuf, August 22nd, and Suleimania, September 9th.

Probably it is a double passage migrant through Mesopotamia. It was obtained at Fao by Cumming on August 20th.

All these specimens undoubtedly belong to the European (typical race), a curious fact since Mesopotamian birds on the whole belong to the Eastern races. The Eastern form of the Reed Warbler (*macronyx*) inhabits the countries east of the Caspian, and Persia, and one would expect that it would have been this race

* By a slip, in the original description 6 mm. "longer" appears instead of " shorter."

which passes through Mesopotamia ; indeed Zarudny records it as a passage migrant and wintering in the Karun district.

(2) One obtained by Cheesman on board " S. S. Lawrence " off Fao on October 1st, 1920, belongs to this paler race.

83. Marsh Warbler. Acrocephalus palustris.

Acrocephalus palustris, Bechst. (Ornith. Taschenb., p. 186, 1803—Germany.)

Cumming obtained a specimen at Fao on March 18th, 1884, and he considered it to be a passage migrant in March and April, as does Zarudny. Witherby found it common in the Highlands of Persia. We have no further records of this species ; I have been unable to trace this Fao bird ; no example of *palustris* is registered from Fao in the British Museum.

84. Sedge Warbler. Acrocephalus schænobænus.

Acrocephalus schœnobœnus, L. (Syst. Nat. Ed., x., p. 184 1758—S. Sweden).

There is little to record about this species and its status is quite uncertain. Cumming obtained one at Fao on May 1st and thought it was resident there and says he had often seen it in long grass near the mouth of the river. Cheesman obtained one in a lucerne field at Ahwaz on May 24th which is a somewhat late date for it to be migrating, but Buxton got one at Amara on May 15th and he had no reason to suppose it bred there, and thinks it is an uncommon spring and autumn migrant. Other specimens were obtained at Basra on May 17th and Sheik Saad on March 24th, while I found it not uncommon in standing wheat at Basra on March 19th. Further observations are required.

The specimens obtained differ in no way from European ones.

85. Olivaceous Tree Warbler. Hypolais pallida.

Hypolais pallida elœica, Linderm (Isis. 1843, p. 342—Greece).

This Warbler is a very common summer visitor to the plains and is recorded from many places from Tekrit down to Fao. The first arrive in the last days of March or early in April, and towards the end of the month they are breeding. It is an inhabitant of scrub and gardens and the nests are placed in various situations in suitable cover ; Buxton and Tomlinson record that rose bushes are frequently selected, the nest being two to three feet up ; Logan Home found nests high up in tall thistles, also in a mulberry ; while several observers noted nests high up in the tops of large willows. Evans, who found a nest in a citron bush, describes it as very small, thin walled and deep, made of white down of a species of grass. Eggs may be found by the middle of May. Tomlinson and Logan Home considered 3, rarely 4, eggs a full clutch ; others have noted 4 eggs while Cumming at Fao found nests with five and six eggs. By the end of June family parties are on the wing, though eggs just hatched are also recorded at that time ; the latest record of this bird is September 17th by which date most have gone.

Considerable confusion has arisen over this bird ; in the B. N. H. Society's pamphlet " *Notes on the Animals of Mesopotamia* " the records of this bird appear under *Scotocerea inquieta*, a bird which does not occur in our area. This mistake arose through Cumming being misled over his eggs and specimens, and in the Journal XXVI, p. 293, he altered the record to *Hypolais languida* which he had obtained at Fao and which he took to be the breeding bird. Jourdain did not entirely clear up matters when he said (t. c. p. 672-3) that he had examined the eggs and they were those of *Hypolais pallida* ! *H.p. elœica* is the only known breeding *Hypolais* in Mesopotamia.

Sixteen specimens examined : 7 ♂♂, Amara, 1-5-18 to 29-6-18, ♂, 17-9-18 (P. A. B.) ; 4, Sheik Saad, 30-3-17 to 23-4-17 ; Sera, 30-4-19 ; Busra, 22-4-17 ; Kazimain, 12-5-19 (P. Z. C. and R. E. C.) ; Busra, 1918 (Hobkirk).

These birds correspond well with Greek specimens ; they are greyer in tone on the upperparts, less brownish in colour, than the typical race from the Nile valley ; altogether a " colder " looking bird. Wings of males 65-68 mm. and the tip of the second primary is nearly always between that of the sixth and seventh. The newly hatched young, like those of other Warblers I have seen, are perfectly devoid of down.

One bird obtained at Fao by Cumming in November 1884 and recorded (*Ibis*, 1886) as *obsoleta* by Sharpe, is considered by Witherby (*Ibis*, 1903, p. 542) to be *pallida* (*p. elœica*). I was unable to find this specimen. Of *Hypolais rama* there is no certain record.

86. Upcher's Tree-Warbler. Hypolais languida.

Hypolais languida, Hempr. and Ehr.(Symb. Phys. fol. cc, 1833—Syria).

Two were obtained by Cumming at Fao on August 27th and 28th, presumably on passage, as this is a hill breeding species. They are in the British Museum. Recorded by Zarudny as a winter visitor and passage migrant in the Karun district in small numbers.

Three half fledged young from Fao registered in the British Museum as belonging to this species are in reality the young of *elœica*.

87. Barred Warbler. Sylvia nisoria.

Sylvia nisoria, Bechst. (Gem. Nat. Deutschl. 4, p. 580, 1795—Middle Germany).

The Barred Warbler is a passage migrant in small numbers but perhaps is commoner than our records indicate, as it is a very shy and skulking bird. Pitman noted a few at Feluja on spring passage from April 24th to 30th; and Cheesman obtained it at Baghdad on the 26th. Weigold records it at Urfa on the 25th and Cumming got one at Fao in May. The spring passage would appear to last but a short time. There are three records in autumn, Basra, September 8th (L. Home) ; Sheik Saad on 11th and Shaiba on the 25th (Cheesman).

Pitman noted that it made all use of any cover it could and Cheesman found it among cotton bushes.

Seven specimens examined : Feluja, 24-4-17, 30-4-17, 29-4-17 (C. R. P.) ; ♂, Sheik Saad, 11-9-17 ; Shaiba, 25-9-16 ; Baghdad, 26-4-19 (P. Z. C. and R. E. C.) ; Busra, 8-9-19 (L. Home), Wings 88-90 mm.

An eastern race has been described by Schalow as *merzbacheri* (Orn. Monat., 1907, p. 3) from Tian Shan ; it is said to have a longer wing and paler head and neck than the typical race. Now I have examined 16 adults from Europe and 16 adults from Central Asia (Afghanistan, E. Turkestan (twelve) including Tian Shan, Kashgar, Khargalik) and I cannot see the slightest difference between them. The wings of the European birds measured 83-92 mm. and those from Central Asia, 85-93 mm. The tone of grey on the head and neck varied in both series—some paler, some darker, in both areas, and it so happens the darkest of all was a Tian Shan bird ! *merzbacheri* is evidently not a good race and a pure synonym of *nisoria*.

It is worth noting that Zarudny records the Eastern Orphean Warbler nesting commonly in the Zagros ; he did not meet with it in Mesopotamia nor have we any records of it.

88. Garden Warbler. Sylvia simplex.

Sylvia simplex, Latham (Gen. Synop. Sup p. 1,p. 287, 1787—England).

A fairly common passage migrant whose times of passage appear to be late and to cover a long period. It arrives about the middle of April and is to be found up to the end of May while Buxton obtained one at Amara as late as June

12th. There is however no evidence of its breeding in our area. It returns about the first week in September and the last record is November 3rd. Zarudny says it occurs in winter, but of this we have no record.

Five specimens examined : ♂, Amara, 12-6-18, ♂, 3-9-18, ♀, 11-5-18 (P. A. B.) ; ♂, Qualet Saleh, 28-5-18 (P. Z. C. and R. E. C.) ; Adhaim, 3-11-17 (C. R. P.).

These appear to be perhaps a trifle greyer on the back than most specimens. Witherby also noted that one from Central Western Persia was rather paler and larger (wing 80). There are however many British ones as large as this. Johansen has described a pale race, *pallida* from Barnaul in W. Siberia and possibly this is a recognisable form, but until one can see a series thence it is impossible to say.

89. Blackcap. Sylvia atricapilla.

Sylvia atricapilla, L. (Syst. Nat. Ed. X, p. 187, 1758—Sweden).

This species also is a passage migrant and seems to be much commoner in spring than in autumn. A few arrive towards the end of March, earliest March 24th, but it is not common until the first week in April during which month a good many pass through, and the passage lasts till mid-May, the latest the 18th. There are but few autumn records ; Tomlinson noted it on autumn passage and Cumming records that it passes through in September and October, Logan Home saw it at Basra on September 26th. Zarudny says it is a winter visitor as well as a passage migrant.

Seven specimens examined : ♂, Amara, 12-5-18, 16-4-18 ; ♀, 21-4-18, 12-4-18, 17-4-18 (P. A. B.) ; ♂, Sheik Saad, 1-4-17 (P. Z. C. and R. E. C.) ; ♀, Basra, 18-5-18 (Venning).

These are not to be differentiated from West European birds.

90. Common Whitethroat. Sylvia communis.

Sylvia communis icterops, Ménétr. (Cat. Rais. Caucase, p. 34, 1832—Talysch).

The Common Whitethroat occurs in fair numbers on both passages ; first noted at Sheik Saad on April 7th when it was plentiful, individuals only halting a few hours ; the passage lasts throughout April and well into May, as Cheesman obtained it at the oasis of Shaiba on May 25th and at Ahwaz on the 22nd. It returns again at the end of August and during September ; last record 23rd.

Cheesman noted that males were in song at Baghdad on April 27th, but there is no evidence of this species breeding.

Eleven specimens examined : Amara, 18-9-18 ; ♂, 4-5-18, ♀, 15-5-18 (P. A. B.) ; ♂, Khazimain, 26-4-19, ♀, Shaiba, 25-5-17, 23-9-16, 8-9-16 ; Ahwaz, 22-5-17 (P. Z. C. and R. E. C.) ; Feluja, 8-5-17 (C. R. P.) ; Basra, 3-5-19 (L. Home). Suleimania, 4-9-19 (Ross).

All belong to the eastern race *icterops* with the back and rump greyer, and the paler rusty edgings to the wings.

91. Lesser Whitethroat. Sylvia curruca.

Sylvia curruca curruca, L. (Syst. Nat. Ed. X, p. 184, 1758—Sweden).

Another common migrant on both passages, arriving rather earlier than the Common Whitethroat, and is widely distributed. First noted March 19th at Basra, it mostly arrives from the first week in April onwards up till the first week in May. Cumming records one at Fao on August 16th, but the main passage appears to last from the middle of September to mid-October. Zarudny says it is a winter visitor as well as a passage migrant. I can only remark that in this as in many other cases Zarudny's records are totally at variance with ours.

Twelve specimens examined : Amara, 16-4-18, 5-4-18, 25-10-17. ♀, 3-4-18, 29-9-18 (three). ♂, 17-10-18 (P. A. B.); Feluja, 2-5-17 (C. R. P.) ; Shaiba, 23-9-16 ; Sheik Saad, 23-3-17 (P. Z. C. and R. E. C.) ; Basra, 18-9-19.

All these belong to the typical race and I have seen no specimens of the eastern race *affinis* from Mesopotamia, but Sharpe identified one from Bushire as belonging to this form.

92. Hume's Lesser Whitethroat. Sylvia althæa.

Sylvia althœa, Hume (Stray Feathers, 7, p. 60, 1878—Plains of India.)

Zarudny gives this as a winter visitor and passage migrant in small numbers in the Karun district and as a common breeding species in the Zagros. We have no skins or records of it. If Zarudny is correct this is a considerable extension of this bird's range westward.

93. Desert Warbler. Sylvia nana.

Sylvia nana nana, Hemp. and Ehr. (Symb. Phys. folio cc., 1833—Tor in Sinai).

Buxton met with this species at Kumait on November 13th, frequenting saline desert where there are scattered bushes of *Sueda* and *Lycium* and no other vegetation, and hardly any other birds. There are one or two other records which might belong to this species. Woosnam obtained it in the Shuteit R. on March 26th. Its exact status is not known.

Zarudny gives it as a common winter visitor in the Karun district and as breeding in the Zagros in small numbers.

94. Menetries' Warbler. Sylvia, mystacea.

Sylvia mystacea, Ménétr. (Cat. Rais. Caucas. p. 34, 1832—Saliane on R. Kur. Caucasus).

This species like several others is only absent from Mesopotamia during the coldest part of the winter ; it disappears about the middle of December and returns at the end of February and early part of March. Thus Buxton noted it at Amara up to December 15th and not again till February 20th, while on March 13th there was a sudden influx. Pitman records it as passing through Feluja April 14th—21st.

Probably it is only in favoured places that it can be found as late as December—as Pitman noticed that in the Adhaim area in November it was very much scarcer than in the previous month. It is a bird of gardens, cultivation, scrub, etc., and is particularly fond of tamarisk and acacia (*Prosopis*). I found it in the non-breeding season a shy and skulking bird, an adept at hiding in a bushy date palm and slipping out unseen on the far side, repeating the same performance in each bush it flew to.

It nests throughout our area in suitable localities at least as far north as Tekrit. The nest is situated in the sort of position chosen by the Common Whitethroat, in scrub, pomegranate, thistles, acacia, etc., and usually one to two feet from the ground. The nest is made of grass stems interwoven with " goose grass ", lined with finer grass stems, also horse hair ; it is a neat, though somewhat loosely constructed, deep cup. At Ahwaz it is stated to breed early in April, but in most places the end of the month would seem to be the more usual date for fresh eggs, while these have been taken as late as June 6th. Mr. Jourdain, who received a considerable number of clutches from our area, informs me that none exceeded four, and in some cases three seemed to be a full clutch, his earliest nest was found on April 9th. There is a considerable variation in coloring ; the average size of 40 eggs was 17·0—13·1 mm.

Twenty-nine specimens examined : Adhaim, 4-10-17, 3-11-17 (three), 15-11-17 (C. R. P.) ; Sheik Saad, 15-9-17, —21-3-17, 24-3-17 ; Shaiba, 23-9-16 (P. Z. C. and R.E. C.): ♂, Amara, 14-6-18, 24-4-18, 23-9-18 (two), 27-3-18, 16-4-18, 3-19, 1-11-17, ♀, 13-3-18; ♀, Kumait, 16-11-17, ♂, 28-2-18: ♀, Baghdad, 5-10-17 ; ♂, Gurmat

Ali, 18-9-19 ; Kut, 1-10-18. ♂, Baghdad, 13-9-17 ; Amara, 11-4-19 (two) (L Home) ; ♂ ♀, Basra, 18-3-18 : ♂, 19-3-18. (C. B. T.).

Few birds caused so much trouble in identification to observers as this little Warbler which was variously reported, besides under its correct name, as " Whitethroat," *S. melanocephala*, *S. momus* and " Subalpine Warbler " ! However of the last three there are no specimens in the collections and no good evidence that they occur and in two of the cases the specimens sent turned out to be *mystacea* !

The males of *mystacea* have the dark crown less well defined and not so black as in *momus*, a longer wing 60-63·5 mm. and the second primary is equal to the sixth or seventh or more often between these two, whereas in *momus* it is between the seventh and eighth ; moreover *mystacea* has the breast vinous pink, varying in amount, so that in worn birds but a faint tint shews. The females (besides the wing differences) are much less warm brown above than female *momus* and not so pure white below (the flanks especially being tinged with vinous buff). The adult male in winter is like the spring male and some even more vinous on the breast (? older birds), but the upperparts have brown edgings to the feathers ; the young birds in first winter plumage in both sexes much resemble the female, the males apparently having no strong vinous wash.

Legs pale brown to flesh yellow ; bill steel grey. Iris yellow brown, orbicular dull brick colour in male, pale buff in female.

Zarudny says *Sylvia momus semenovi* winters commonly in the Karun district and breeds in numbers in the Zagros ! I do not know this bird of Zarudny's and if common it is curious that no one obtained any, but his description sounds very like the first winter *mystacea* except that his measurements run smaller, *viz.*, 51-61 mm.

Mr. Jourdain (*Ibis*, 1920, p. 310) has recorded eggs of *S. momus* from Mesopotamia ; as recorded above many have mixed Mènètriès' Warbler up with other species, and there is no definite evidence so far that *S. momus* occurs at all.

95. Eastern Rufous Warbler or Grey Backed Warbler. Agrobates galactotes. "Humurra."

(1) *Agrobates galactotes familiaris*, Mènètr. (Cat. Rais. Cauc., p. 32, 1832—Kur, S. Caucasus).

(2) *Agrobates galactotes syriaca*, Hemp. and Ebr. (Symb. Phys. fol. b. b., 1833—Beirut in Syria).

This species is a very common summer visitor to Mesopotamia and must be familiar to the least observant. It arrives at the end of April and early May, the earliest date recorded being April 17th, and though some leave as early as the end of August, most depart again during September or early in October. It is a common garden bird and occurs in suitable places throughout the country. It starts to breed soon after arrival,—as early as the end of April according to Tomlinson, but most nests may be looked for about the middle of May, while eggs are recorded in June and July, so that probably it is double brooded. The site often chosen is a young palm three or four feet up, or in rubbish against the trunk of a large palm, but also fairly close to the ground, in or under bushes, in walls or sides of irrigation canals ; the eggs are four, often five, in number and vary very much in type. The nest is a fairly solid structure made of grass, etc., and pieces of snake skin are recorded as being utilized in the lining, as well as hair and jute string.

This familiar little bird is said to be a beautiful whistler ; Magrath writes of it " it was quite delightful the way it utilized the ropes of one's tent as a perch from which to utter its pretty little song, often darting into the tent to take an insect from the floor between the performances ; as an accompaniment to the song the tail is flirted, expanded and elevated sometimes almost touching the back of the head ". Fourteen specimens examined (April to September) very

somewhat *inter se*, but all must be attributable to this form except one, which is quite inseparable from *syriaca*. This was obtained by Pitman at Feluja on April 24th where typical *familiaris* also occurs and breeds. Pitman records that many Rufous Warblers passed through Feluja for elsewhere and possibly this bird was also *en route* for further west. Weigold says the Euphrates is the dividing line between these two races, *familiaris* to the East, *syriaca* to the west, but of course he here alludes to the Upper Euphrates which runs roughly north and south through the district he was in, Urfa, where he obtained *familiaris*; at Bab in Syria not very far from Urfa he obtained *syriaca*. Zarudny records *syriaca* from the Karun district as a very rare vagrant.

The juvenile plumage of this species resembles the adult, but has broad pale edges to the tertials and wing coverts.

Zarudny described *A. familiaris persica* (J. F. O. 1911, p. 238) from the Karun district, Zagros and Beluchistan. The collections do not contain any specimens from the Karun ; those from Basra appear to be typical *familiaris*.

96. Streaked Wren-Warbler. Prinia gracilis. "Abu Zar," "Zeater."

Prinia gracilis lepida, Blyth. (J. A. S. B. 13, p. 376, 1844—Indus Territories).

This Wren-Warbler is common and resident throughout our region from Daur to Fao and Shustar. It is not recorded however from Urfa by Weigold or from Mosul. In winter it is not nearly so conspicuous, keeping to thick cover especially Acacia jungle (*Prosopis*), corn and reeds. In summer, according to Pitman, it spreads out more or performs local migrations, and is then seen in places where in winter it was not to be found. Besides frequenting reedy ditches it is to be found, according to Buxton, far out in large reed beds half a mile from land, where he came across it on February 23rd near Ezra's Tomb, and again on April 21st, so that in this somewhat unusual habitat it probably nests also.

It breeds throughout its range ; Cumming gives the nesting season as April to June but the latter half of May appears to be the usual time for first nests with eggs ; many nests were reported from this date to July and Buxton found fledglings on September 20th so that probably two or more broods are reared. Almost any thick cover, bushes of acacia and tamarisk, thistles, etc., are utilized for the nest. Cheesman, who found a nest five feet up in a tamarisk, describes it as egg shaped with a large opening in the side, made of fine grasses interwoven with thistle down and spider's cocoons and lined with thistle down. Logan Home notes that the birds add to the nest after laying, and reports finding a nest of *Cisticola* appropriated by a pair of this species which had built on a dome to it. The full clutch is four or five, sometimes three, and Cumming has found a nest with six eggs.

The usual coloration of the eggs is a pale greenish ground, spotted thickly or thinly with red-brown.

The song, which may be heard as early as the middle of February, though usually not till some weeks later, is described by Cheesman as being like a grasshopper's note followed by a bubbling or bursting sound. The Arabs are well acquainted with this bird which in the south they call " Abu Zar " (but at Baghdad Cheesman says it is called " Zeater "). Abu Zar means " Father of nakedness ", no doubt in reference to its scanty feathering. The Arabs say " it is the *sheik* of all birds, because though so tiny yet his beak is so sharp that he can sit on the head of any bird and pick out its brains." It would be interesting to know how this legend arose ; I give it as it was given to Buxton by the Arabs on the Hawazie swamp.

Twenty specimens examined : Shustar, 20-1-18 (F. M. B.) ; Shaiba, 30-9-16 ; Khazimain, 6-4-19, 10-5-19, 11-5-19 ; Busra 18-2-18 (P. Z. C. and R. E. C.) ;

Amara, 3-11-17) (two), 11-2-18, 5-4-18, 18-9-18, ♀, 4-2-18 ; Baghdad, 25-9-17, ♀, 22-3-18 ; ♀, Amara, 6-6-18 ; ♀, Gurmat Ali, 18-8-18 (P. A. B.) ; Adhaim, 13-11-17 (C. R. P.) ; Akuba, Euphrates, 9-4-18, ♀, 9-4-18 (Venning) ; ♀, Basra, 17-3-18, 18-3-18 (C. B.T.).

This series is not in very good order, the skins are not good ones, some were juveniles, others in moult. They are so near to *lepida* that I cannot separate them, they vary rather, some seem a trifle greyer, others darker ; *lepida* from India also varies. Pattern of the tail as in *lepida*. I was at first very surprised that the *Prinia* should be the same as the Indian one, but on consideration perhaps it is not so remarkable, as the range extends probably continuously along South Persia into Beluchistan and Sind.

The Scrub Warbler (*Scotocerca inquiteta*) crept into Cumming's list of Fao birds and into the Bombay N. H. Society's pamphlet through a mistake as explained under *Hypolais p. elœica*. It does not occur so far as we know ; it is of course a " hill " bird.

97. Fan-tailed Warbler. Cisticola cisticola.

Cisticola cisticola, subsp, ?

In the lower part of Mesopotamia, at all events, this Warbler is found as a resident in small numbers and somewhat locally. The only places it is recorded from are Sheik Saad, Amara and Basra ; possibly it was overlooked by others elsewhere, or recorded as some other Warbler. Buxton found it not so uncommon at Amara but local, and he noted that it particularly frequented the edges of vegetable gardens where the cultivated parts were being invaded by desert scrub, such as *Prosopis*. Logan Home found it fairly common in suitable places near Basra. On June 12th he found two pairs building in green grass over water or wet ground ; the nests were then half built. Owing to continual cutting of the grass it was not till the end of July that he found a completed nest,—one with young on the 20th, and one with three eggs on the 27th, while nests with young were found as late as August 17th. The nests, well concealed and of the usual purse shape with the opening at the top, were composed of spider's webs and plant down and lined at the bottom with Bull-rush down. The peculiar jerky upward flight in the neighbourhood of the nest and the distinctive note will be familiar to those who have been in India.

Five skins examined : Sheik Saad, 14-12-16 (P. Z. C. and R. E. C.) ; Amara, 16-12-17, 30-12-17 (P. A. B.) ; Amara, 17-4-19 (tail lost) ; Basra, 14-8-19 (very worn) (L. Home.)

It is unfortunate that so poor a series of this bird was obtained, three fair winter specimens and two bad summer ones. The winter birds have fairly broad white tips to the tails and I cannot see much difference between these and the Indian *cursitans* ; however on such a series it would be premature to come to any definite conclusion as to what race inhabits Mesopotamia.

It is curious and significant that no *Cisticola* was found in Persia or Beluchistan by Zarudny, Blanford, etc.

98. Mesopotamian Babbler. Crateropus altirostris.

Crateropus altirostris, Hart. (Vög. Pal. F., p. 623—Fao).

This Babbler, which is peculiar to Mesopotamia, appears to be rather patchy in its distribution. At Fao where Cumming got the first known specimens (recorded as *huttoni*, Ibis, 1886, p. 484) he records it as plentiful. In the palm groves and cultivation round Basra I found it rather common ; it is reported as very common at Nasariyeh, but quite rare at Amara itself and Kut. But in the gigantic reed beds near Amara and Nahr Umar, it is common, the birds inhabiting reeds growing in water as much as a mile from land ! From Kut to Baghdad and thence to Tekrit on the Tigris, and from Nasariyeh to Feluja on the Euphrates, which includes several districts well worked by various observers, there

are no records; however Buxton met with it again at Khanikin on the Diala river on the Persian (Khurdistan) frontier! Zarudny records it as resident in the Karun district and also in the Zagros.

This Babbler is of course resident and breeds. Cumming says at Fao it nests from April to mid-June and he has found eggs as late as June 19th when many young were on the wing, so that probably this, like other species, rears more than one brood. Cumming gives the usual clutch as three eggs, Tomlinson, who records it from Basra and Ahwaz, says five eggs, but it is not certain that all his records refer to this species; in fact Jourdain informs me the larger clutches he received from Tomlinson were those of *huttoni*. The eggs are glossy blue and measure 20-21·5 by 16·5 mm.

Its habits, except for its propensity for reed beds, do not appear to differ from those of others of the genus, it may be recognized at once in the field by each member of the flock fluttering out of a bush one after the other and sailing to the bottom of the next bush. Hartert makes a mistake in putting this Babbler as a race of the Indian bird, as the larger Babbler *huttoni*, which *is* clearly a race of the Indian bird, occurs in the same area. It should stand as a separate species. Its smaller size, more curved and weaker bill and almost spotless upperparts at once distinguish it from *huttoni*!

Twenty specimens examined: ♂, Basra, 18-2-18; ♀, Amara, 30-1-18; Fao. 8-7-17; Amara, 18-10-16, 12-8-18, 14-2-18, (P. Z. C. and R. E. C.); ♀, Amara, 18-10-18; ♀, Basra, 15-8-18; Amara, 9-1-18; ♂, Ezra's Tomb, 23-2-18; Khanikin, 23-11-18 (two pairs) (P. A. B.); Nahr Umar, 24–3–18 (C. R. P.); Amara, 7-3-19 (?); ♀, Basra, 21-11-17 (two); ♂ ♀, 19-3-18 (C. B. T.).

The juvenile plumage is very different to that of *huttoni*. Upperparts pale sandy grey with fine dark shafts to crown and back; chin and vent white, rest of underparts creamy buff and unstreaked; ear coverts creamy buff.

Wings 74-80 mm.; tail 102-107 mm. Bill from base 20·5-24 mm. Wing formula 4 and 5 longest, 3=8.

99. Hutton's Babbler. Crateropus caudatus.

Crateropus caudatus huttoni, Blyth. (J. A. S. B. xvi., p. 476, 1847—Kandahar).

This larger Babbler would appear to have a restricted range in Mesopotamia. Its headquarters are in and around Baghdad where it is not uncommon, inhabiting date palm gardens. Cheesman met with it at Zoar on the Tigris in jungle and again at Nahr Umar, and at Khanikin on the Diala river. In both these latter places *altirostris* also occurs; Woosnam obtained it at Bund-i-kir and Zarudny records it from the Zagros. It is resident where it occurs; Cheesman, who found a nest of three fresh eggs at Khazimain on April 13th, says the nest was placed in the heart of a young date bush well concealed by tall thistles and rank herbage growing up into the bush. The nest, loosely constructed but firm, was an open thin walled cup, the foundations made of grass and corn stalks with a few dry roots and grass stems interwoven with date palm fibre and lined with finer fibre. The eggs measure 23·5 by 19 mm. They are not so deep in colour as those of *altirostris* and four is the more usual clutch, even five.

In habits it seems to resemble the Indian race, the call note is a tremulous twitter, occasionally a scale of falling notes; food consists of *coleoptera* and small white seeds.

Thirteen specimens examined and compared with type and series of topotypes: ♂, Abed. 9-2-18 (F. M. B.). ♂ ♀, Azizieh, 16-10-18; ♂ Baghdad, 13-11-18 (two); ♀, Baghdad, 9-2-19; ♂ ♀, 14-2-19; Baghdad, 10-11-17, 15-2-19; ♀, Nahr Umar, 17-2-18 (P. Z. C. and R. E. C.), ♂ ♀, Baghdad, 10-10-17 (P. A. B.).

I thought at first that Mesopotamian birds were separable from typical ones from Khandahar having darker and greyer upperparts with rather heavier

markings and greyer less fulvous underparts, but I found that several individual birds from Mesopotamia were quite inseparable from Khandahar birds and that the characters I relied on were variable in birds from both localities and I think in part was due to the make of the skins. Wings, ♂ 88-94, ♀ 85-87. Tail 116-130 mm.

The juvenile plumage of *huttoni* is quite different to that of *altirostris*; it is heavily streaked above especially on the head where the dark markings take up most of feather and, with the pale edges to the feathers, gives it a spangled appearance; in this plumage it is very similar to that of typical *caudatus*.

100. Song Thrush. Turdus philomelos (=musicus auct.)

Turdus philomelos philomelos, Brehm. (Naturg. Vög. Deutschl, p. 382, 1831—Central Germany).

This is a winter visitor, widely distributed and commoner than the Blackbird. To a certain extent it is also a weather migrant. The time of arrival is about mid-November and some depart again early in March and most have gone by the end of the month. Weigold records one at Urfa on April 19th. A shy retiring bird it is met with mostly singly, affecting scrub, date gardens, etc. Buxton noted that it suddenly became quite common on December 11th, 1917, at Amara during a sudden cold snap and strong north winds and it remained common up to the end of February.

Eight skins examined: Shustar. 31-1-18, 1-1-19 (F. M. B.); Samarra, 8-3-18, 6-3-18, 5-3-18 (C. R. P.); ♂, Qalet Saleh, 25-11-17 (P. Z. C. and R. E. C.); Sulemania, 12-11-19 (Ross); ♂, Basra, 18-3-18 (C. B. T.). All are of the typical race.

101. Blackbird. Turdus merula.

(1) *Turdus merula syriaca*, H. and E. (Symb. Phys. Aves. folio. b.b. 1828—Syria).

(2) *Turdus merula intermedia*, Richm. (Proc. U. S. Nat. Mus., xviii, 1895, p. 585, 1896,—Aksu E. Turkestan).

The records are too few to say much about the Blackbird beyond stating that it is apparently a rather scarce, though widely distributed, winter visitor. The first record relates to December 2nd and there are records each month to March 19th throughout the length of the country from Mosul to Fao.

Sassi records the typical race from Mosul in January; Witherby identified one obtained by Woosnam at Shush on March 18th as *syriacus* (Ibis, 1907, p. 83) and Zarudny says this latter race nests and winters in the Zagros in small numbers.

(i) ♀, Baghdad, 12-17. W. 122, T. 110. Bill base 25 mm.

(ii) ♀, Amara, 6-2-18. W. 136. T. 123. B. 27 mm. (P. Z. C. and R. E. C.); ♂, Baghdad, 5-12-17. W. 137, T. 121·5. B. 27 mm. (Ingoldby).

The Baghdad bird is clearly *syriaca*; the other two are too large for this race and correspond well with *intermedia* from Turkestan. Over these determinations Dr. Hartert, who kindly examined these specimens, agrees with me. Woosnam's bird, above referred to, and one obtained at Fao by Cumming are equally large and must also be referred to *intermedia*. *Syriaca* however *does* occur in S. W. Persia whence I have seen one in Witherby's collection.

102. Black-throated Thrush. Turdus ruficollis.

Turdus ruficollis atrogularis, Temm. (Man. d'ornith, 1, p. 169, 1820—Austria).

Pitman saw two males of this Thrush feeding on berries in scrub near Amara on January 30th, 1916. Tomlinson met with it at Basra on March 5th, 1911, and Zarudny lists it as a winter visitor in small numbers for his area.

Possibly a weather migrant as in many other places.

103. Rock Thrush. Monticola saxatilis.

Monticola saxatilis, L. (Syst. Nat. Ed. 12, p. 294, 1766—Helvetia).

A passage migrant, not common; noted by Tomlinson at Basra on March 30th; in April at Samarra and Gurmat Ali on April 29th by Logan Home. Armstrong found it common at Fao on April 28th and Buxton got a single one at Amara on May 12th. It would appear to be commoner at Fao than elsewhere as Cumming notes it passing through in March and April; Zarudny records it as a winter visitor and passage migrant. We have no records in winter.

104. Blue Rock Thrush. Monticola solitarius.

Monticola solitarius transcaspicus, Hart. (Bull B. O. C., 23, p. 43, January 1909—Tedjen, Transcaspia).

Naturally a scarce bird, probably it is more or less resident in the hills, wandering to the plains in small numbers in winter, as in other parts. Logan Home saw it in the cliffs at Tekrit, and Aldworth says it breeds there. Cheesman got a male at Mosul on December 12th. Zarudny says it breeds in the Karun district, doubtless in hilly parts round Ahwaz and Bund-i-kir where Woosnam got it on March 5th.

This is a paler form with rather a shorter wing than the European bird. I am in doubt as to which race the Mosul bird belongs but as Hartert says he has seen this race from Fao I leave it provisionally under this name. Blue Rock Thrushes from Mesopotamia, especially breeding birds, are *desiderata*.

105. Common Wheatear. Ænanthe ænanthe.

Ænanthe œnanthe œnanthe, L. (Syst. Nat. Ed., x, p. 186, 1758—Sweden).

The Common Wheatear is mostly a passage migrant through Mesopotamia. The first arrive about the second week in March and from the end of March onwards to mid-April it is plentiful while it is not until about the middle of May that all have passed on again. The return passage commences about mid-August and this species is again plentiful during September and well on into October. It appears that a few, here and there, remain during the winter. Pitman records it from Samarra during the winter months as does Logan Home at Tekrit; Pitman also noted a few at Kut, Kurna and Sheik Saad in January, etc.

Twenty-eight specimens were obtained all in March and April, and September and October except the following: Suleimania, 15-11-19 (Ross); Shat-al-Adhaim, 3-11-17; Bait-al-Khalifa, 11-1-18; Kut, 10-1-18 (C. R. P.).

I refer all these for the present to the typical race; besides these I have examined a good many others from the east and I can see amongst them ones with longer bills (*rostrata*, H. and E.) and ones with paler mantles (*argentea*, Lonnb). In this latter form the pale mantle is not always associated, as Lonnberg says, with a broader white forehead; in the case of *rostrata* so many specimens are intermediate in size of bill between this and the typical race that it is impossible to draw a line, the intergradation is too great. Until one can see a good series of these two supposed races from their breeding grounds, it seems best not to recognize them as distinct. What however is noticeable about these Mesopotamian specimens is that they tend to run longer on the whole in length of wing:—Fourteen males measure 97-100·5, once 102 mm.: some western European birds run up to 100 mm., but among these Mesopotamian males there are none of wing length of 94-96 mm. such as often is found among the former. The great majority of our specimens are no paler on the mantle than the typical race. The bills measure 17 to 19 mm. mostly 18 mm.

106. Desert Wheatear. Ænanthe deserti.

Ænanthe deserti albifrons, Brandt. (Bull. Acad. St. Petersb., 2, 1844, p. 139—W. Siberia).

The Desert Wheatear as a winter visitor is widely distributed in small numbers, but is nowhere very common except when it first arrives, and then in favoured places a fair number may be seen, as on the Adhaim, where Pitman found it not very uncommon at the end of September and first part of October; either they spread out afterwards to other places or some pass right through the country, as in winter scattered examples are the rule. It first arrives early in September and the last record we have is the first week of March. It is partial to the vicinity of scrub and cover, as well as to nullahs and desert, and frequently settles on small bushes.

Zarudny says it nests in small numbers in Mesopotamia; he does not specify where but presumably in the hills near Ahwaz, perhaps beyond our area. He lists the race *montana* as a rare winter visitor.

Twelve skins examined: ♂, Baghdad, 17-9-17 (P. A. B.); Legait 2-3-18; ♂, Beled, 22-2-17 (P. Z. C. and R. E. C.); ♂, Ahwaz, 10-1-19 (Armstrong); ♂ ♀, Adhaim, 14-11-17, ♂, 29-9-17, 23-9-17, 17-10-17, 14-10-17, 20-10-17; ♂, Kut, 20-2-17 (C. R. P.).

These are typical *albifrons* with wings of males 91-95 mm.; none shew the large amount of white in the wing which *montana* has.

107. Black-eared Wheatear. Ænanthe hispanica.

Ænanthe hispanica melanoleuca, Güld, (Nov. Com. Petrop., 19, p. 468, 1775—Georgia).

This is a spring and autumn passage migrant through Mesopotamia from the middle of September to mid-October, and again at the end of March and in April. It appears to be widely distributed but not very common. Weigold found it common at Urfa from April 11th to 23rd frequenting stony ridges and the males were singing. Zarudny records this bird, under the name *amphileuca*, as a passage migrant and also his race *gaddi*; this latter I have seen no specimens of, and his description of it sounds to me like that of an individual variation, especially as he records in other districts of Persia hybrids between *gaddi* and *amphileuca* and between *gaddi* and *melanoleuca*!

He says both the black-eared and black-throated forms breed commonly in the Zagros, the latter is there a migrant, the former being found but rarely in winter. *Melanoleuca* certainly breeds no further off than Kasr-i-Sherin and Pa-i-taq (Buxton).

Six specimens examined: ♂, Amara, 16-10-18 (black-throat); Baghdad, 10-10-17; (white-throat); ♂, 15-9-17 (P. A. B.), ♀, Feluja, 23-3-17 (black-throat), 23-3-17 (white-throat); ♀, Shat-al-Adhaim, 29-9-17 (black-throat) (C. R. P.).

I have followed the latest fashion in uniting black-throated and black-eared (=white-throated) specimens of this Wheatear, as the concensus of opinion seems to be that they are dimorphisms of one species and I have no proof to offer one way or another. Until some one makes a special study of these birds in their breeding quarters to ascertain whether the two forms interbreed, either by obtaining black-throated females paired with white-throated males, or by rearing nests of young ones, this much debated point will never be satisfactorily settled. It could easily be done by any one who has the opportunity. There is this to be said for uniting them that it must be very rare to find two otherwise similar species always more or less migrating together and breeding in the same areas; on the other hand if they freely interbreed one would expect hybrids between the two to be commoner than they are; their habits, etc., seem to be similar.

108. Pied Wheatear. Ænanthe pleschanka.

Ænanthe pleschanka pleschanka, Lepech (Nov. Comm. Petr., 14, p. 503, 1770—Saratov on the Volga).

A passage migrant in small numbers and widely distributed, passing through in March (earliest March 1st) and again at the end of September and during October, in which month it is more plentiful than at other times. Tomlinson says it is not uncommon at Basra on both passages and Cumming obtained it at Fao in April and October. Cheesman notes that it flies straight up in the air in pursuit of flies, but I do not think that this habit is confined to this species entirely. It may be commoner than our certain records indicate but some observers confused this with the former and the next species. Zarudny lists it as a passage migrant and also the white-throated variety (*vittata*).

Nine specimens examined: ♂, Legait, 1-3-18; ♂, Shaiba, 4-10-16; Sheik Saad, 29-3-17 (P. Z. C. and R. E. C.); Adhaim, 30-9-17, ♂, 14-10-17 (two), ♂, 20-10-17, 17-10-17 (C. R. P.); ♀, Basra, 1918 (Hobkirk).

109. Barne's Wheatear. Ænanthe finschii.

Ænanthe finschii barnesi, Oates (Faun. B. India 2, p. 75, 1880—Baluchistan).

This fine black and white Wheatear is a winter visitor, apparently much commoner in the area above Baghdad on the Tigris, where stony ground, cliffs and nullahs occur, and in the foothills, than in the alluvial plain below Baghdad whence there are few records. The earliest record is October 20th and the latest March 1st. It is rather a wary bird, found singly or in pairs, frequenting bare nullahs, cliffs, ruins, and desert mounds.

It certainly breeds, according to Cheesman, in the Pa-i-taq mountains on the Kasr-i-Sherin-Kermanshah road and may possibly do so in the neighbourhood of the former place. Zarudny records *finschii* and *finschii turanica* as winter visitors to the Karun district. I take both of these to be synonyms of this bird.

Thirteen specimens examined: ♂, Kumait, 28-2-18 (P. A. B.); ♂, Kazimain, 13-2-19; Beled 1-3-19, ♀, 22-2-19 (P. Z. C. and R. E. C.); ♂, Adhaim, 13-11-17, 20-10-17 (two), 22-10-17, 14-11-17; ♂, Beit-al-Khalifa, 11-1-18, 30-1-18 (two); Samarra, 6-2-18 (C. R. P.).

I consider all these to be the race now known as *barnesi*: wings of males 90-93, ♀ 89 mm. The females all have grey throats. This is one of those cases where great confusion will be caused by the changing round of names. This species was always called *finschii* and the more eastern race of it *barnesi*. Hartert in his Vög. Pal. Fauna, p. 690, changed the specific name to *melanoleuca* of Guldenstadt, a name which had always (falsely according to him!) been used for the Eastern Black-eared Wheatear. The name *finschii* has now been reinstated and *melanoleuca* goes back once more to its original owner. The net result of this is that, in the period between these changes and probably for some years to come, records under *melanoleuca*, unless very carefully given, will be open to doubt as to which Wheatear is referred to!

110. Isabelline Wheatear. Ænanthe isabellina.

Ænanthe isabellina, Cretzschm (Atlas zu Ruppell's Reise. Vögel, p. 52, 1826—Nubia).

The status of this species is not quite clear; probably a few are resident and their numbers are augmented by winter visitors. Cumming says it is a winter visitor at Fao remaining till well on into spring and an occasional one is to be met with in summer. Buxton saw one near Amara on July 13th and obtained one on the 25th, so probably a few remain out in the salt desert to breed. Zarudny too says it breeds in small numbers in the Karun district; on the Syrian boundary it certainly breeds, as Weigold records that he shot a breeding female in April on the steppes between Urfa and Aleppo.

This species is rather more of a bare desert bird than the other wheatears even, and Buxton noted its partiality for salt desert with scanty vegetation of scattered bushes of *Sueda* and *Lycium*,—the sort of country where it and *Sylvia nana* reign supreme! Here it is not uncommon; elsewhere, though met with, it is somewhat local and few in number. Pitman saw two chasing each other, and the male singing well, on January 29th at Samarra.

Six specimens examined; Beled, 22-2-19 (P. Z. C. and R. E. C.); Kut, 25-7-18 (P. A. B.); ♂, Basra, 27-2-18 (Armstrong); Suleimania, 5-9-19 (Ross); Kut, 4-1-17, Samarra, 7-2-18 (C. R. P.).

111. Red-tailed Wheatear. Ænanthe xanthoprymna.

(1) *Ænanthe xanthoprymna xanthoprymna.* Hemp and Erh. (Symb. Phys. fol. dd., 1833—Nubia).

(2) *Ænanthe xanthoprymna cummingi*, Whit. (Bull. B. O. C. x, p. 17, 1899—Fao).

(3) *Ænanthe xanthoprymna chrysopygia* (de Fil) (Arch. Zool. Genova ii., p., 381. 1863—Demavend in N. Persia).

It is unfortunate that we have no records or specimens of any form of this Wheatear and so can add nothing to what has already been recorded, but I will give a short *resumé* of the three races in order that future workers who are fortunately placed may know what is wanted.

(i) This, the first described form, is a rare bird and has been found in what are evidently its winter quarters, or its passage route, in Nubia, Egypt, and the Red Sea Coast, and according to Zarudny it nests in the desolate hills which border the lower Karun on the east side.*

(ii) Cumming's Wheatear is a still rarer bird apparently; it was described from a specimen which Cumming obtained at Fao on passage; he gives it as passing in August and September and again in March and April. (Ibis, 1886, p. 483, where Sharpe erroneously called it *mœsta*). It has been found twice, in January and November in Berber Prov. Sudan, and twice in the Red Sea Prov. in March. Zarudny says it is common on passage on the heights of the Jebel Tnüe near Ahwaz.

Possibly these two birds are not so rare as they appear to be; one can well imagine that a species which breeds in such out-of-the-way places as hills in S. W. Persia, which presumably migrates across Arabia and winters perhaps in unfrequented parts of Africa and has not a wide distribution, might well for many years escape the eyes of ornithologists.

Zarudny says that, *according to the testimony of Arab hunters and shepherds, cummingi* nests in the same hills as *xanthoprymna*. If this is so, then it would seem almost certain that one is a dimorphic variety of the other, but this would certainly have to be founded on better proof than the statements of Arab shepherds!

(3) This is the best known of the three, it breeds in the Persian Highlands and is not at all uncommon in Beluchistan and N. W. India in winter. Zarudny lists it as a winter visitor and passage migrant in small numbers in the Karun area and thinks it may nest also. He considers this bird a species of itself and *cummingi* as a race of *xanthoprymna*; he may be right but one cannot really determine this until the status of all of these is better known, and so I have left them, as Hartert placed them, for the present.

Chrysopygia may always be known by its greyish underparts, isabelline grey upperparts and having red at the base of the tail; sexes similar. *Cummingi* male like *chrysopygia* but the head and throat black; *xanthoprymna* like *cummingi* but base of tail white; in the last two, sexes not alike. All three have *reddish* upper tail coverts.

* Since writing this, I have received from Cheesman an adult male of this race obtained close to Baghdad on September 23, 1920

112. Mourning Wheatear. Ænanthe lugens.

Ænanthe lugens lugens, Licht (Verz. Doubl. Mus. Berlin, p. 33, 1823—Nubia).

Weigold states that a pair were seen and the female obtained at Bumbudj on the Euphrates on April 8th; this is hardly in our area, but I mention it as Zarudny says he obtained it at Dizful on March 12th and at Sia Manssur in the same area on March 8th. Its status requires further investigation. Hartert (Vog. Pal. F., p. 695) does not mention its occurrence further north or east than Palestine.

113. Persian Wheatear. Ænanthe persica.

Ænanthe persica, Seeb (Cat. B. Brit. Mus. V, p. 372, 1881—Shiraz).

Mentioned by Zarudny as a passage migrant in small numbers in the Karun area, and breeding in the Zagros.

114. Indian Pied Wheatear. Ænanthe picata.

Ænanthe picata, Blyth. (J. A. S. B. xvi., p. 131, 1847—between Sind and Ferozopore).

One was obtained by Bailey at Shustar on January 15th. Zarudny gives it as a passage migrant in small numbers. Probably it is a scarce winter visitor to the foot-hills in the Karun district only.

115. White-tailed Wheatear. Ænanthe leucopyga.

Ænanthe leucopyga, Brehm. (Vogelfang, p. 225, 1855—Assuan.)

Zarudny says he obtained one near Ahwaz on February 26th, 1904. This is a considerable extension of this bird's range north from S. Palestine and its status requires further investigation.

116. Hume's Wheatear. Ænanthe alboniger.

Ænanthe alboniger, Hume (Stray Feathers, i., p. 2, Nov. 1872—Hills of Sind).

Buxton obtained a single specimen on the Diala River near Shahroban on November 22nd, 1918. Zarudny gives it as a winter visitor in the Karun district. From my knowledge of it elsewhere I should say it must be resident where it occurs.

From the above list it will be seen that a very large number of kinds of Wheatears may be found in our area, and a good many of these are "black and white" birds, chiefly or exclusively to be found on or near hilly ground. Any one who gets a chance to be in suitable situations for them I would remind that their status is little known and that observations *without specimens* are well nigh useless, as in the field many are so alike. One or more species of black and white wheatear certainly nests in the Ahwaz district as Tomlinson found a nest on the Jebel Sanam on May 29th with fully fledged young.

117. Whinchat. Saxicola rubetra.

(i) *Saxicola rubetra rubetra*, L. (Syst. Nat. Ed. xi, p. 186, 1758—Sweden).

(ii) *Saxicola rubetra noskae*, Tsch. (Orn. Jahrb., 1902, p. 234—N. Caucasas).

(1) Zarudny lists the typical race as a rare winter visitor and passage migrant. As the Karun district is very far to the east of this bird's range, its occurrence requires further examination.

(2) This race, to which our specimens belong, is apparently a winter visitor in small numbers, which are added to during the times of migration, but even then is not very common. Cumming at Fao recorded it in November and May. Buxton records it at Amara on December 1st, early September, and late in February. Hingston noted it at Feluja on November 22nd—whence Pitman

obtained specimens on March 29th and April 14th in scrub near cultivation where small flocks were halting on passage. Other records relate to Samarra, March 15th, and Kut, January 29th and April 8th.

Weigold found Whinchats not uncommon at Urfa on passage, April 12th to 20th. He attributes most to this race, and one to the typical race from its very dark brown colour. Zarudny records it as rare.

Three skins examined: ♀ Feluja, 14-4-17, 29-3-17 (C. R. P.); ♂, Basra, 20-4-17 (P. Z. C. and R. E. C.).

118. Stonechat. Saxicola torquata.

(i) *Saxicola torquata rubicola* L. (Syst. Nat. Ed. xii, p. 328, 1766—France).

(ii) *Saxicola torquata maura*, Pall. (Reise Prov. Russ. Reichs. ii., p. 708, 1773—Ural).

These two forms were not as a rule distinguished in the field and as the status of each appears to be the same I include the two together.

The Stonechat is a winter visitor to the plains and foot hills throughout our area in fair numbers. As they are most plentiful during the periods of migration they also probably are passage migrants through the country. The first arrive early in September but they are not common till the end of the month; from then till mid-November they become fairly numerous. In December and January they become scarce and numbers begin to pick up again as migration commences at the end of February; plentiful in March they move off north towards the end of the month, and a few are left up to about the middle of April. Last record May 7th.

Except at times of passage the species is rather local though widely distributed, and though fairly common in some places it is not to be seen at all in others, doubtless being drawn to sheltered spots where food supply is abundant.

They frequent scrub, crops, gardens, etc., often in pairs. I am unable to find any distributional difference between the two races, both occur throughout our area and both together; *maura* would appear to be the commoner. The nearest breeding ground of the latter is near Shiraz and the Zagros.

(i) Seven skins examined:—♂, Amara, 25-10-17, 26-10-17, 1-12-17, 3-11-18, ♀, 23-11-17 (P. A. B.); ♀, Shustar, 3-2-18 (F. M. B.); ♀, Kazimain, 15-2-19.

All these are quite typical *rubicola*; they have no white at the base of the tail; in the males the upper tail coverts are spotted and in the females this part is brown. Wings: ♂, 65·5-67; ♀, 63 mm.

(ii) Nineteen specimens examined:—♂, Baghdad, 19-3-18 (two); Amara, 3-11-18, 13-2-18, 1-12-17, 7-4-18, 11-9-18; Kurna, 17-3-18; L. Akkarkuf, 12-10-17; ♀, Amara, 2-9-18, 11-9-18, 30-10-17, 13-1-18; Ezra's Tomb, 23-2-18; Baghdad, 19-3-18, 31-3-18 (P. A. B.); ♂, Basra, 19-3-18 (two), ♀, 19-3-18 (C. B. T.).

The white at the base of the tail of this race varies very much and is partly at all events due to age. The adult males have a large amount of white extending well beyond the coverts, and sometimes leaving only a broad tip of black, these I take to be the so-called *hemprichi*. Males of the year have the outer web of the outer tail feather dark and the dark band at the tip of the tail broader. In the females there is less white than in the young males even, and is often quite hidden by the upper tail coverts.

Males of *maura* are whiter on the belly than males of *rubicola*; in both sexes the upperparts are markedly paler and the upper tail coverts are immaculate white, tinged with rusty brown in winter. The females of *maura* are paler below than the females of *rubicola*. A few females are practically indistinguishable from females of *indica*, having little or no white at the base of the tail, however in absence of any males of *indica* in our area I do not include this race.

119. Pied Bush-Chat. Saxicola caprata.

Zarudny lists this as an accidental straggler to the Karun district. It presumably would belong to the race *rossorum* which occurs in Transcaspia and Persia, etc.

120. Common Redstart. Phœnicurus phœnicurus.

(1) *Phœnicurus phœnicurus phœnicurus*, L. (Syst. Nat. Ed. x., p. 187, 1758—Sweden).

(2) *Phœnicurus phœnicurus mesoleuca*, Hemp. and Erh. (Symb. Phys. fol. ee., 1832—Jedda in Arabia).

In dealing with the Redstarts I have largely to go by specimens obtained, as the notes are meagre and observers not only mixed these two races up but also certainly mixed the Common Redstart up with the eastern form of the Black Redstart (*phœnicuroides*). The males of *mesoleuca* are easily distinguishable in the field by the white edging to the secondaries from the common form; in all males of the Black Redstart the black comes further down on the breast; and in both sexes the sixth primary is emarginate which is not the case in the common Redstarts; the female Black Redstarts are on the whole darker than the female of the Common Redstarts, but are almost impossible to differentiate in the field.

(i) This race arrives during the first week of April, a few perhaps earlier, and its time of passage lasts the whole month. Pitman noted a big migration, through Feluja on April 18th and all had gone by the first week in May; males predominated as also noted by Weigold at Urfa, where during the second and third weeks of April this was one of the commonest birds. The return passage appears to be late, there is no record before the first week in October, they are then common up to mid-November. Possibly some over winter as Cumming records one on February 25th at Bushire and Zarudny gives it as a winter visitor; several observers thought they saw it in winter; the vast majority however appear to be passage migrants.

Nine skins examined: ♂, Amara, 3-4-18, 25-10-17; Kumait, 14-11-17 (P.A.B.); ♂, Kazimain, 9-4-19 (P. Z. C. and R. E. C.); ♂, Sulimania, 15-11-19 (Ross); Shat-al-Adhaim, 18-11-17, ♀. 22-10-17 (C. R. P.); ♀, Baghdad, 10-11-17; ♀, Basra, 24-4-18 (Venning).

(ii) Passage migrant, arriving in the middle of March; noted at Amara on 13th, Basra on 17th, where males were not uncommon, Shuteit R. 26th, Ahwaz, 30th. Pitman saw a few at the end of March and early April. Cumming says it occurs at Fao in April, May and June, and Zarudny gives it as a passage migrant and winter visitor to the Karun district. We have no winter records.

Specimens examined: ♂. Amara 13-3-18 (P. A. B.); ♂, Basra, 17-3-18, 19-3-18 (C. B. T.).

121. Black Redstart. Phœnicurus ochruros.

(i) *Phœnicurus ochruros ochruros*, Gmel. (Reise d. Russland. iii, p. 101, 1774—Mountains of Persia).

(ii) *Phœnicurus ochruros phœnicuroides*, Moore (P. Z. S., London, xxii. p. 25, 1855—Northern India) (I restrict this to Shikarpore in Sind).

Both races of Black Redstart are common winter visitors to our area; they apparently arrive towards the end of October, perhaps earlier, and most leave the plains by the second week in March. They are usually found singly, inhabiting old ruins, ravines, trenches or open country and are more wary and shy than common Redstarts. It appears from the specimens obtained that the common Black Redstart from Mosul to below Baghdad is *ochruros* and there are no certain records of *phœnicuroides* in this area, whereas below Baghdad *ochruros* is scarce and there are plenty of specimens of *phœnicuroides* thence: both however occur at Shustar and Zarudny lists both in the Karun district

(1) Fourteen specimens examined: ♂, Shustar, 20-1-18, 15-1-18 (F. M. B.); ♂, Khazimain, 9-2-19 (two) ♂ Mosul, 7-12-18: ♀, Sheik Saad, 3-3-17 (P. Z. C. and R. E. C.); ♂, Amara, 13-12-17 (P. A. B.); ♂, Samarra, 7-3-18, 13-12-17, ♂, 6-3-18, 18-1-18, 13-12-17; ♂, Adhaim, 8-11-17 (C. R. P.); ♂, Sulimania, 14-11-19 (Ross).

In *ochruros* the black comes further down on the underparts than in *phœnicuroides*; the underwings black and the auxillaries dark grey tinged with orange; some of the above males are not quite typical in that the black comes further down than usual, in one the vent only is not black and in three others the belly and vent is dark grey tinged with rusty orange, however they agree better with *ochruros* than with *gibraltariensis* (*titys* auct.), as in this race there appears to be never any orange tinge on the axillaries and vent. In young males the upperparts are grey with brown edges and the black underparts, except the chin, are much hidden by grey and fulvous edges. The females are warmer brown above, less grey brown; browner, less smoky grey below; more isabelline in axillaries and underwing, and rather smaller than females of *gibraltariensis*.

Wings ♂ 81-86, ♀ 77-83 mm.

(2) Eleven specimens examined: ♂, Amara, 13-1-18, 29-11-17, 10-1-18, 25-10-18, 25-10-17, ♀, 3-11-17, 29-11-17, 18-12-17, 21-1-18 (P. A. B.); ♂, Zoar, 4-2-19 (P. Z. C. and R. E. C.); ♀, Shustar, 7-1-18 (F. M. B.).

These males are not so black on the back as specimens from the Punjab, also the wing formula seems to be often different. In Punjab birds the second primary equals the seventh or is between seventh and eighth in length; in these Mesopotamian specimens the second is often between the sixth and seventh, there also appears to be a slight difference in size of the bill. Possibly the Persian breeding bird is separable, but without a series of breeding birds from Persia and India it would be unwise to recognise it.

Zarudny gives *semenovi* as a winter visitor and *titys* as a passage migrant in the Karun district. The former bird I do not know and the latter, if it really occurs, is a very long way out of its range.

There is no evidence that *semirufa* occurs in our area.

122. Eversmann's Redstart. Phœnicurus erythronota.

Phœnicurus erythronota, Eversm. (Add. ad. Pall. Zoog. Ross. As. 2, p. 11, 1841—Altai)

This is another of the species which comes in winter into Mesopotamia from the far N. E. Buxton obtained one at Amara on December 31st, 1917, and saw a male there on March 11th, 1918. Zarudny lists it as a winter visitor. There is a specimen in the British Museum from Fao.

123. Nightingale. Luscinia megarhynchos.

Luscinia megarhynchos africana, Fisch. and Reichw. (J. F. O., 1884, p. 182—near Kilimandjaro, E. Africa).

Most of the records apparently refer to this Nightingale. It is almost certainly a summer visitor, arriving at the beginning of April; Cheesman obtained one at Sheik Saad on March 31st and heard it in song at Basra on April 23rd. Logan Home says there were many at Amara and thinks that they were breeding or about to breed in the orange groves there, where they were singing on May 10th, an observation which Buxton confirms. Cheesman notes that they were evidently breeding at Kazimain on May 15th where they had been singing for a fortnight, and he obtained a specimen.

Of the song he says it compares well with that of the English bird but has some slightly different notes. He heard it at Shush on May 2nd.

In the Urfa district Weigold records that the European Nightingale, *L. m. megarhynchos* arrived on April 12th and became common and was seen daily

in song till the 28th; he obtained a single specimen of *africana* in April 16th and one which he considered to be *golzii* but not typical, on the 17th: but from what he says about its size (W. 85) and coloration it seems doubtful if it really belongs to this race. Zarudny records *golzii* as a winter visitor to the Karun district.

The two specimens obtained by Cheesman certainly belong to the Persian race *africana* and not the paler Turkestan one, *golzii*. Further investigation is required in the status of this and concerning other races which are said to have occurred.

124. Thrush Nightingale. Luscinia luscinia.

Luscinia luscinia, L. (Syst. Nat. Ed. x., 1758—Sweden).

Pitman met with this species at Feluja during the spring migration, when from April 27th to 30th they were very plentiful in willow and other scrub, and very skulking; he obtained two. Cheesman obtained a single bird at the oasis of Shaiba on September 27th. There is no evidence that this species breeds in the country; probably it is a passage migrant. Weigold noted it as common in spring passage arriving April 16th at Urfa. Cumming at Fao regarded it as a winter visitor arriving in the autumn and staying till late in the spring; he obtained specimens in October, January and on May 8th. Zarudny records it in winter from the Karun district so apparently a few must even winter in Mesopotamia though the majority seem to pass through.

The three specimens examined are quite typical.

125. Blue-throat. Luscinia suecica.

1. *Luscinia suecica magna*, Zar. and Loudon. (Orn. Jahrb., 1904, p. 225—Bidesar in Arabistan).
2. *Luscinia succica volgæ*, Kleinschm. (Falco. iii, p. 47, 1907—Sarpa, Lower Volga).

Several races of Blue-throat evidently inhabit Mesopotamia and from the field notes it is impossible to differentiate the status of each race.

The race which breeds in S. W. Persia (*magna*) is usually without a spot on the blue-throat or has a small white spot, but it is easily distinguished in the hand from other races by its superior size. Probably all observations under the White-spotted Blue-throat refer to this race. This race certainly arrives early in August, as one might expect from the nearness of its breeding haunts, and is common by mid-August. Cheesman obtained one at the oasis of Shaiba in the Syrio-Arabian desert on September 5th which suggests that it was a passage migrant as none winter there. Buxton saw a white-spotted bird at Amara on November 28th, the latest record of this form.

It becomes evidently common again at the end of March and several specimens were obtained in full breeding dress, the last on April 19th. Cumming under *cyaneculus* probably refers to this race which he says appears in March on spring migration at Fao, and is seen through April to mid-May in pairs.

There is no certain evidence that this race winters in Mesopotamia, some race however probably does so.

Pitman says that he met with several Blue-throats on February 19th near Kut, and Buxton found it common at Amara on December 4th, but thought all had gone by mid-December: Pitman however saw one near Amara on January 24th. Like some other species, *e.g.*, Swallow and Sand Martin, it is likely that most depart for the few colder weeks of mid-winter, odd stragglers remaining in some well sheltered spots.

Two birds obtained in November and December by Buxton I cannot separate, except that they are rather small, from the typical race (*L. s. suecica*) but quite possibly they are *volgæ*, to which race I certainly refer one obtained in March at Sheik Saad and possibly a female from Amara. Weigold obtained

a Blue-throat at Urfa on April 11th but is in doubt to which form it should be referred, as it was a female; Zarudny records *pallidogularis* as wintering in the Karun district as well as the typical race.

During their sojourn in the country Blue-throats may be found in any thick cover, scrub, wheat fields, and particularly thick reeds on the edges of swamps or damp ground. They are always rather skulky and shy.

The race *magna* is I think very distinct; the long wing ♂80-83·5, ♀78-79; the long tail (60-63) and bill 16·5-17 mm. distinguish it from other races but in addition the blue of the throat, which is intense deep blue with or without a small white spot (as also obtains in the European white-spotted, *cyanecula*) joins the red of the breast *without any limiting black line*, which all other forms have. The adult male in winter has the chin and throat above the blue, isabelline with moustachial streaks of blue, the first winter male has less blue and this part has wide pale edges; chin and throat creamy white, while black spots form the moustachial streaks.

Fourteen specimens examined:

L. s. magna, ♂ Kut, 9-8-19; ♂ Amara, 4-4-18; Baghdad, 31-3-18 (P. A. B.); ♂, Basra, 19-4-17; ♀ Shaiba, 5-9-16 (P. Z.C. and R.E. C.); ♂, Feluja, 28-3-17; ♂, Nahr Umar, 26-3-18; ♂, Akkarku, 22-8-18 (C. R. P.) ♂ Basra, 21-8-19; ♀ Basra, 148-19 (L. Horne). ? *L. s suecica* ♂ ♂ Amara 29-11-17, ♂ 13-12-17 (P. A. B.). *L. s. volgæ* ♂, Amara, 20-3-19, ♂, Sheik Saad, 20-3-17 (P. Z. C. and R. E. C.).

126. Robin, Erithacus rubecula.

(1) *Erithacus rubecula hyrcanus*, Blanf. (Ibis., 1874, p. 79—Ghilan).
(2) *Erithacus rubecula caucasicus*, But. (Orn. Monat. 1907, p. 9—Caucasus).

These two races of Robin are inseparable in the field and the field notes probably apply to both. Buxton at Amara found Robins to arrive about 20th—23rd of October and soon became common, some passed on in November and the rest wintered in the gardens and thick *Prosopis* scrub; about the middle of January they began to sing and they disappeared during the third week of February. Both races were present at Amara. Pitman found Robins fairly common in thick scrub in the Adhaim and Samarra areas during November and December and met several in reeds and rushes at Kurna on January 17; his records also apply to both races. I came across Robins not uncommonly at Basra in November frequenting date palms, gardens and willows bordering the river, I found them very shy and skulking and their weak winter song sounded to me much like the English birds; my birds were all *hyrcanus*. Robins are recorded in winter at Ramadi, Tekrit, Kut, Fao and as late as March 14th at Shus, so that one may say one or both races are fairly common throughout the area in suitable places. Both races are listed as winter visitors to the Karun area by Zarudny, who also includes the European Robin, while of one got in January at Ras-el-Ain between Mosul and the Syrian border Neuman says it matches well the European bird; none of the skins which I have examined can be however assigned to this race.

Nineteen skins examined:

E. r. hyrcanus: Amara, 23-10-18, 16-2-18, 5-12-17, 20-10-17 (two) (P. A. B.); Baghdad, 27-1-19 (P. Z. C. and R. E. C.); Abed, 8-2-18 (F. M. B.); Basra, 20-1-17 (four) (C. B. T.); Samarra, 13-12-17, 7-3-18 (C. R. P.). *Caucasicus*; Amara, 31-10-18, 20-10-18, 11-1-18, 3-11-17 (P. A. B.); Samarra, 14-12-17, 4-11-17 (C. R. P.).

E. r. caucasicus stands intermediate between *hyrcanus* and the typical race in colour of the back and throat, it has a smaller bill than *hyrcanus* and less red brown on the upper tail coverts. Most specimens can be picked out easily but two of Buxtons were rather intermediate between the two races.

127. White-throated Robin. Irania gutturalis.

Irania gutturalis, Guérin (Rev. Zool., 1843, p. 162—Abyssinia).

This species appears to be a scarce passage migrant and was only noticed in spring ; it is probably commoner than the records indicate however, as it is an arch skulker. Pitman met with two pairs in willows and scrub at Feluja between April 27th and May 3rd and obtained one specimen, he found them almost impossible to beat out of the scrub they inhabited. Cheesman met with a pair at Sheik Saad on April 5th hopping about a stack of brushwood in some grass.

Magrath noted it at Basra as early as March 25th and Armstrong found several pairs at Fao on April 22nd. At Urfa Weigold records odd birds on April 15th and 28th. Zarudny gives it as a passage migrant and also as a winter visitor in small numbers in the Karun district. It breeds in the Zagros and the highlands of W. Persia.

128. Wren. Troglodytes troglodytes. subsp., ?

Logan Home says that he saw one or two Wrens in sheltered nullahs at Kelat Shergat in winter and one on the uplands at Tekrit in a ravine in December. Ludlow saw one at Hit on March 8th. Without specimens it is impossible to say what Wren visits Mesopotamia. *hyrcanus* has been described from N. Persia, *zagrossiensis* from the Zagross Mountains in S. W. Persia by Zarudny and Loudon, while according to the former another race *subpallidus* inhabits Khorasan.

No Accentors are recorded from Mesopotamia.

129. Common Swallow. Hirundo rustica.

Hirundo rustica rustica, L. (Syst. Nat. Ed. x, p. 191, 1758—Sweden).

The Common Swallow may be said to be a summer visitor, though in parts of Mesopotamia, such as Fao, they are only entirely absent during December and January. The first ones may be looked for from the 10th to 20th of February, but in some places, or more probably in some years, quite a number have put in an appearance by the middle of the month. Thus at Samarra and Sheik Saad in 1918 they were numerous by mid-February (first seen on 5th and 10th respectively) and had even started to build, though March is the more usual month for nesting to begin. They breed throughout the area in suitable localities, choosing varied sites, huts of natives and telegraph buildings (Fao) and houses in most places, cliffs and even tent poles of the camps. As elsewhere two or more broods are probably raised as fresh eggs are reported on April 20th. and young on the wing on April 26th. Many move off again at the end of August and they are scarce early in September.

The numbers seem to fluctuate during this month probably due to passage migrants, as many must pass through Mesopotamia to and from breeding grounds further north. I noted them crossing the head of the Persian Gulf on March 20th when the local birds would be settled down to nest. The last seen in autumn were in the last days of October.

Three skins examined ; ♀, Bagubah, 29-7-18 (P. A. B.): Kazimain, 27-3-19 (P. Z. C. and R. E. C.); Samarra, 3-18 (C. R. P.).

These are not to be differentiated from the European bird. Pitman records that at Feluja on March 19th—31st he saw a few pairs of Swallows with chestnut red underparts and again a few at Samarra in February. They did not appear to him to be so deep a red as the Egyptian bird, and they were evidently on passage.

His description of course tallies well with the Palestine form *transitiva* which might wander to this part of Mesopotamia, but in absence of specimens I cannot definitely include it.

Weigold only met with the typical form at Urfa.

130. Red-rumped Swallow. Hirundo daurica.

Hirundo daurica rufula (Temm. Man. d'Orn. 2, Ed. 3, p. 298. 1835—Egypt).

This species appears to be rare ; Pitman saw two on passage at Feluja on March 26th and Cheesman met with several pairs at Maidan-i-Napthun on May 28th and found colonies on two occasions in caves bordering on a stream. Tomlinson recorded two pairs near Ahwaz in April 1908 and also two pairs building at Shustar on April 19th and thinks the latter were driven away by Common Swallows which were nesting there. Zarudny lists it as a winter visitor and passing migrant in small numbers in the Karun district.

131. House Martin. Delichon urbica.

The only records are those of Buxton who says that this species arrived at Amara on April 5th, 1918, and remained till May 5th. Weigold noted it in Syria on April 30th but not within the borders of Mesopotamia. It apparently is a scarce passage migrant. No specimens obtained and so I leave it under the binomial name.

132. Sand Martin. Riparia riparia.

Riparia riparia riparia, L. (Syst. Nat. Ed. x, p. 192, 1758—Sweden).

This is a common summer visitor to the Euphrates and Tigris, building in suitable places. It arrives in the last days of March and migrants pour in during the whole of April, some to remain, others passing north. A few may be seen earlier in March as I saw one at Basra on the 18th and two more near Shat-el-Arab L. Vessel on the 20th ; Cheesman noted first arrivals on the 29th at Sheik Saad, and Pitman on the 30th at Kut.

At Fatah Gorge, Cheesman saw a great migration on April 18th following the line of Jubel Hamrin. It breeds in the steeper banks of the rivers in numbers, there being colonies at intervals all the way from Kurna to Baghdad. Logan Home noted tunnelling operations on June 6th at Daur and fresh eggs were obtained on June 14th. At the end of June great numbers began to collect into flocks and probably some move off during July and August ; in September great numbers are still to be found these left being doubtless reinforced by passage migrants from elsewhere ; most have gone by the third week in October, but Cumming at Fao recorded it in every month except January and February.

Five skins examined : ♂, Amara, 7-9-18, W. 109 ♂, 3-9-18, ♂, 14-4-18, W. 109, (P. A. B); Kurna, 4-7-17, W. 100 (P. Z. C. and R. E. C.), I cannot separate these in any way from the typical European race.

133. Pale Crag Martin. Riparia obsoleta.

Riparia obsoleta, Cab. (Mus. Hein. 1, p. 50. 1850—N. E. Africa.)

Recorded by Zarudny as a passage migrant in the Karun district.

134. Syrian Woodpecker. Dryobates syriacus.

Dryobates syriacus, H. and. E. (Symb. Phys. Aves fol. r., 1833—Mt. Lebanon).

Weigold records odd ones in April at Urfa where he supposes it is resident. No records elsewhere. Common in the Zagros.

135. Wryneck. Jynx torquilla.

Jynx torquilla torquilla, L. (Syst. Nat. Ed. x, 1, p. 112, 1758—Sweden).

Not very common, or else overlooked, as a passage migrant. Cheesman met with four on autumn migration at Gurmat Ali and Logan Home saw three at Basra on September 18th ; Buxton saw two at Baghdad on September 24th and 29th. It is recorded from Samarra on April 5th, Logan Home saw it at Basra in the third week of April ; Cheesman records it at Ahwaz on April 29th and May 24th. Weigold noted it at Urfa also in mid-April.

136. Cuckoo. Cuculus canorus.

Cuculus canorus canorus, L. (Syst. Nt. Ed. x., 1, p. 110, 1758—Sweden).

A passage migrant and not very common judging from the scanty records. The spring migration takes place during the last three weeks of April. It does not sing in the Mesopotamian plain, but Cheesman noted that as soon as it reached the higher Persian plateau it sings and breeds there. In autumn there are only three records August 8th, September 27th, and October 10th.

Cheesman noted that it fed on the caterpillars of the Painted Lady.

Four specimens examined : ♂, Feluja, 16-4-17 ; Adhaim, 27-9-17 (C. R. P.) ; Shaiba, 9-8-16; Kazimain, 9-4-17 (P. Z. C. and R. E. C.).

I cannot separate these from west European birds.

137. Great Spotted Cuckoo. Clamator glandarius.

Clamator glandarius, L. (Syst. Nat. Ed. x, 1, p. 111, 1758—Gibraltar).

Weigold met with several pairs at Urfa in April and thought they would certainly nest in the nests of *Corvus cornix*. Woosnam obtained one at Bund-i-Kir on the Karun on March 6th and Zarudny includes it as a passage migrant. It breeds in the oak woods of S. W. Persia and it is curious that no one came across it in our area.

Swifts. Micropus.

Swifts were badly reported on owing no doubt to the difficulty of distinguishing them and collecting any. The following records *probably* apply to either *murinus* or some race of *apus*.

Swifts were reported as breeding in June in the cliffs at Daur by L. Home and probably breeding (seen in June and July) in the Kerbela district ; there are scattered records of Swifts from February to October at Kut, Tigris R., Adhaim, Basra, Zobeir. Some specimens are noted as arriving at Feluja on April 12th in one year, at Baghdad on March 17th in another. Stoneham saw large migrations of Swifts going north at Samarra on April 29th and onwards till May 17th.

138. Common Swift. Micropus apus pekinensis.

Micropus apus pekinensis, Swinh. (P. Z. S. Lond. 1870, p. 435,—Pekin).

Some race of *apus* certainly occurs at Baghdad where on May 20th Cheesman saw them apparently breeding ; he says that on April 26th about ten pairs had recently arrived and he obtained one which he was certain was *apus* but unfortunately the skin has been lost.

Woosnam obtained one at Shustar on March 21st which has been determined by Witherby as *pekinensis*, which race Zarudny gives as a passage migrant, as he does also the typical race.

139. Pallid Swift. Micropus murinus.

Micropus murinus murinus, Brehm. (Vögelfang, p. 46, 1855—Siut in Egypt).

Cheesman found this Swift common at Ahwaz on May 5th and it was breeding in all the larger houses ; he obtained one specimen. Cumming got two at Fao in March and he records a nest and three eggs taken by his collector at Fao (?). Cheesman is certain that this species also occurs at Baghdad where it was apparently breeding on May 20th. Zarudny gives it as nesting and wintering in the Karun district.

140. Common Indian Swift. Micropus affinis.

The only record is from Shush where Cheesman saw one flying round the castle on May 3rd. Probably it is the race *galilejensis* which occurs.

Photo. Capt. C. R. Pitman.

A.—Curious mound-like nest of Black-winged Stilt with 3 eggs, in a shallow inundation a few miles W. of Museyib on the R. Euphrates. 12-6-17.

Photo. Capt. C. R. Pitman.

B.—Typical breeding country of Sand-grouse (*Pterocles alchata caudacuta*) on right bank of Tigris near Kut. Sept., 1916.

BIRDS OF MESOPOTAMIA.

(Plate V,—Sand-grouse chicks—is unnumbered.)

141. Common Nightjar. Caprimulgus europæus.

1. *Caprimulgus europæus unwini*, Hume (Ibis, 1871, p. 406—Hazara, N. W. India).
2. *Caprimulgus europæus sarudnyi*, Hart. (Vög. Pal. F., p. 849, 1912 Tarbagatai Mountains).

These two races are passage migrants through Mesopotamia in fair numbers. The spring passage takes place in the last week of April and the first part of May, and the return passage during September ; latest record October 4th. Cumming says it occurs from autumn to spring at Fao. Zarudny records *europæus* as wintering, and *unwini* as wintering and a passage migrant.

We have no winter records of any Nightjar.

unwini probably breeds in the Jebel Hamrin, as Cheesman obtained one at Khanikin on May 21st, with organs well advanced. Unlike *ægyptius* this species often roosts on date-palm stems and seems to prefer an arboreal seat to the ground.

(1) ♀, Khanikin, 21-5-19 (P. Z. C. and R. E. C.); Shat-al-Adhaim, 4-10-17 (C. R. P.).

These and one from Fao in the British Museum are nearer *unwini* than any other race, but do not seem quite typical, nor is one which Witherby got in Persia, nor one from Shiraz ; but apparently *unwini* varies much even in N. W. India. If one had a larger series from Persia perhaps another race could be recognized. The Adhaim bird is a young bird and matches well a young one from N. W. India.

(2) ♂, Shaiba, 8-9-16 (P. Z. C. and R. E. C.); ♂, Amara, 24-4-18 (P. A B.); ♀, Fao, 7-4-18 (Armstrong).

I cannot separate these from birds from Krasnoyarsk, etc., they certainly are not *unwini*, they are much darker and much more coarsely marked.

142. Egyptian Nightjar. Caprimulgus ægyptius.

Caprimulgus ægyptius ægyptius, Licht. (Verz. Doubl. Mus. Berlin, p. 59, 1823—Upper Egypt.)

This Nightjar is a common summer visitor and a numerous passage migrant. The earliest record is March 20th and most come quite early in April and settle to breed in many places throughout the area ; it is particularly common in the Feluja-Baghdad-Museyib district.

Nests may be found in a variety of situations, as on shingle near the river at Samara, coarse grazing land, bare desert, in scrub under bushes, etc. The earliest nest recorded was on April 12th and two more on the 14th (Feluja district), though Tomlinson says at Basra they do not breed till the end of May. Fresh eggs are recorded on June 3rd and incubated ones on the 28th. Two is of course the invariable number. When nesting on grazing land many eggs are trodden on by cattle.

It becomes exceedingly plentiful in August and September when probably the local birds are reinforced by migrants from elsewhere, though it seems to be particularly patchy in distribution, one place holding numbers while in other similar localities none are seen ; thus Buxton knew of a small walled garden at Amara about half an acre in extent where he could always find a dozen or so and never saw them elsewhere ; Pitman too found hundreds roosting on a certain patch of stony ground at Akkarkuf, while Magrath relates how in riding across some old fallow land the birds were so numerous that it looked as if the clods of earth were getting up and flying away ! At Ali Gharbi Cheesman saw numbers flying aimlessly about slowly and not feeding at 4-30 P.M. on August 8th, and he fancies the ground had got too uncomfortably hot for them with a shade temperature of 120°. In the day time they are found roosting on the ground in palm groves. The night call is described by Pitman as being like rapid hammering on wood " toc-toc-toc-toc."

Most leave in September and there are only odd records after the first week in October up to the 22nd.

Zarudny gives this species as nesting ? and passage migrant ? both of which there is no shadow of doubt about and he also definitely states that it is to be found in winter, a statement which none of our records bears out !

Eleven skins examined: ♂, Baghdad, 30-7-18; ♀, Amara, 9-9-18; ♂, Kurna, 20-3-18; ♂, Baghdad, 15-9-17 (P. A. B.); ♂, Shaiba, 12-9-16, ♀, 3-9-16; ♀, Sera, 2-5-19 (P. Z. C. and R. E. C.); ♀, Feluja, 12-4-17; Hindeyeh Barrage, 3-6-17 (C. R. P.); ♀, Basra, 11-8-19 (L. Home) Amara, 4-4-19 and 4 in B. M. from Fao. Wings 190-206 mm.

All are typical *ægyptius*; *arenicolor* (of Sewertzow : type loc. Oxus) does not appear to me to be a good race so far as I can judge ; one specimen from there is certainly large (W. 212) but another is only 202 mm., and specimens from Samarkand are no larger than Egyptian ones.

143. European Bee-eater. Merops apiaster.

Merops apiaster, L. (Syst. Nat. Ed. x, 1, p. 117, 1758—S. Europe.)

To most parts of Mesopotamia this is a common passage migrant but to parts of the foot hills it is a summer visitor. It arrives at the end of March and migration continues up to the second week in May. It is widely distributed and migrating flocks were noted passing over in several localities from Urfa to Fao.

According to Tomlinson it breeds up the Karun river where he found young just hatched at the end of May; up the Kerkha river Cheesman found it gradually replacing *persicus* as a breeding species, and he saw excavations going on at Shush on May 2nd, where *apiaster* alone was breeding in thousands. This replacing of the one species by the other is not universal by any means, as in many places throughout their distribution both species breed in the same area. At Mosul it evidently breeds, as Sassi records skins thence early in June and it may possibly breed at Khanikin (and elsewhere in the hills) where Cheesman saw it on May 21st.

The autumn passage lasts from the first week in September to the first week in October.

Three specimens examined : ♂, Shush, 3-5-17 (P. Z. C. and R. E. C.); 2 Baghdad and Amara (P. A. B.)

144. Persian Bee-eater. Merops persicus.

Merops persicus persicus, Pall. (Reise (*d*). versch. Prov. Russ. Reichs. ii, p. 708, 1773—Shores of the Caspian).

Like the Roller this species is a summer visitor in very large numbers and also a passage migrant. The first arrive in the middle of March and it becomes common by the third week. Migration was seen going or across the head of the Persian Gulf on March 20th and April 11th.

It occurs and breeds throughout our area from Mosul to Fao but at Shush Cheesman noted that it was replaced by *apiaster*, but as *persicus* breeds in N. Persia this must have been a local peculiarity. It breeds in colonies, some of them numbering thousands of individuals ; the sites chosen are river and canal banks, desert mounds or perfectly flat bare ground. Cheesman noted that at the oil fields *persicus* seemed to prefer a horizontal road passed over by caravans and other traffic, while *apiaster* preferred mounds; Pitman found a large colony near Museyib in perfectly flat ground close to a road ; the birds were swarming over the nest holes like bees ! Sassi describing a similar colony (of which he gives a very good photograph) says the nesting ground in the distance looked like green pasture with the multitude of birds on it ! Other very large colonies exist between Baghdad and Samarra and at Abu Aran near Basra.

Excavations for the nest-holes were noted on April 19th, and the earliest date for eggs is May 5th, but it is not till towards the middle of the month that full clutches need be looked for ; six is the normal full clutch, and in one nest of six

it was noted that some were near hatching, while others were half incubated only.

Young well fledged are reported in mid-June. The nest holes go in 5 to 7 feet and if in flat ground at an angle of 10 to 15 degrees ; the entrance holes are hard and worn smooth by the constant passage of birds.

The war did much to accommodate this bird in providing miles of perch in the form of telegraph wires and nesting sites in abandoned trenches.

This Bee-eater moves off again at the end of August, and flocks migrating over, going in some southerly direction, were noted on many days during September in several places, and up to October 13th. Cheesman noted that they migrated by night as well as by day, and their distinctive calls were often to be heard on dark nights in September as the flocks passed over. Towards the end of October they became scarce and there is an odd record on November 14th.

The Arabic name for both species of Bee-eaters and Roller is the same—Khundar.

Specimens examined : ♂, Amara, 6-6-18. *Juv.* 5-7-18 (P. A. B.); Nahr Umar, 26-3-18 (two) (C. R. P.) ; Baghdad, 17-8-17 (Ingoldby) ; Shaiba, 12-9-16, 18-9-16 (P. Z. C. and R. E. C.) ; ♂, Basra, 18-3-18 (C. B. T.).

The young leave the country in their juvenile dress.

145. Little Green Bee-eater. Merops orientalis. (=viridis auct.)

Merops orientalis beludschicus, Neum. (Orn. Monat. 1910, p. 80—Persian Beluchistan).

We have no certain record of this bird ; however it must occasionally occur as Cumming noted it once at Fao after a severe storm. Zarudny says it nests in small numbers in the Karun district and is a migrant ; it has been met with at Bushire in January to March and occurs along the south coast of Persia. St. John (Eastern Persia, p. 125) says it extends to Basra, if that is so I must have overlooked the record.

146. Hoopoe. Upupa epops. "Had-Had."

Upupa epops epops, L. (Syst. Nat. Ed. x) i, p. 117, 1758—Sweden).

It is chiefly as a passage migrant that the Hoopoe occurs in Mesopotamia though a few pass the winter in suitable localities and odd ones are met with in the breeding season, but there is no evidence that they nest in our plains ; however it certainly breeds at Urfa and may do so in our hills, as it appears in the plains very early in autumn.

Though occasional birds are recorded in December to February, it is not until the second week in March that the migration sets in, and Hoopoes become very common towards the end of the month ; the migration continues during April and most have passed on by the end of the month. There is a single record in June from Amara and several other indefinite records of birds being seen during "the summer." Odd ones are recorded in the last half of July near Baghdad, probably early migrants from not far off ; it becomes common by the middle of August and is plentiful up to the first week in October, but most have gone by the middle of that month. Migrants were noted in the middle of the Gulf on August 13th and 31st.

Weigold records it breeding in pollarded mulberries at Urfa. Zarudny says *epops* and *loudoni* are winter visitors to the Karun ; the latter is a synonym of the former (*vide* Hartert, Vög. Pal. F., p. 867).

The Arabic name is of course onomatopœic and widely used in the east for this bird.

Four specimens examined: ♀, Shaiba, 8-9-16 (P. Z. C. and R. E. C.); Basra, 17-8-17; Kurna, 17-3-18; ♂, Amara, 25-2-18 (P. A. B.).

147. Common Kingfisher. Alcedo ispida.

1. *Alcedo ispida pallasii,* Rchb. (Handb. Spec. Orn. Inv. Alcedineæ, p. 3, 1851—Volga).
2. *Alcedo ispida pallida,* Brehm. (Vogelfang, p. 51, 1855—Egypt).

(1) A resident in the Mesopotamian plain whose numbers are increased by winter visitants. This Kingfisher is perhaps not common as a breeding bird or else it retires to less frequented spots, as most observers considered it to be a winter visitor. It is reported as breeding however at Baghdad and Basra by Cheesman, while Tomlinson's records of *bengalensis* breeding at Basra must belong to this race. Cumming records it at Fao from August to April and specimens sent home were identified by Sharpe as *bengalensis* ; I have examined these and I consider them to be *pallasii*. Pitman noticed this Kingfisher at Feluja till April when it disappeared, and during the summer he found none in the marshes near there nor at Museyib. In winter even it seems rather local and in places quite common, thus it is reported common at Basra and Baghdad and rare at Amara.

Five specimens examined : Basra, 4-2-17 (Armstrong) ; Kurna, 17-3-18 ; Akkarkuf, 21-8-17 (C. R. P.) ; Baghdad, 26-9-17 (P. A. B.), ♀, Basra, 18-2-18, also two from Fao in B. M.

These correspond best with *pallasii* ; the bills do not appear to me to be so long and slender as in *pallida* ; they are too large and not bright enough for *bengalensis*. Wings 72-74. Bills 37-38 from feathering, 42-44 from base. No specimens were obtained in the breeding season but in absence of any other race one concludes that this is also the breeding form.

(2) One obtained by Weigold at Urfa, April 21st (wing 74, bill 40) is recorded by him as *pallida* ; Neumann also considers one obtained at Ras-el-Ain on February 7th,with a remarkably slender bill of 41 mm. to belong to this form.

148. Pied Kingfisher. Ceryle rudis. "Esleligga."

Ceryle rudis rudis, L. (Syst. Nat. Ed. x, p. 116, 1758—Egypt).

A very common resident from Fao and the Karun river to Mosul but naturally few are met away from canals or rivers. It is commoner below Amara than above, but it is common above Baghdad on both the Euphrates and Tigris.

There are colonies all the way up the Tigris where the banks are high and Pitman records a colony at Kurna, consisting of hundreds, in a bank which is unaffected by floods and so affords a secure nesting place each year. Eggs are reported early in June and five seems to be the usual number.

This Kingfisher seems to prefer the shallower parts of the river and backwaters to the deeper water ; Buxton met with it in the Hawizieh swamp in July many miles from land. The flocking and flighting to roost in the evening up the river must have struck the least observant and the shrill cry of several together is bound to attract notice.

Five specimens examined : ♂, Qalet Saleh. 26-5-18; ♂, Baghdad, 21-9-17, ♀, 26-9-17 (P. A. B.) ; ♀, Kurna, 30-12-17 (P. Z. C. and R. E. C.) ; Basra, 12-5-19.

These are typical *rudis*, and not the Indian form, with the base of the tail spotted and longitudinal streaks on the flanks.

149. White-breasted Kingfisher. Halcyon smyrnensis. "Mahel-Hel."

Halcyon smyrnensis smyrnensis, L. (Syst. Nat. Ed. x, p. 116, 1758—Smyrna).

This Kingfisher has rather a curious distribution in Mesopotamia ; up as far as Nasiriyeh and Kurna it is fairly common and resident ; at Amara Buxton only saw it twice in 13 months, *viz.*, August 31st and April 5th and he thought these must have been migrants, a statement supported by Cheesman who says the only one he saw at Sheik Saad (April 5th) was migrating. On the Euphrates

above Nasiriyeh we have no records, and above Kurna only records of probable migrants. At Baghdad however it occurs again and is probably resident there in small numbers, as Cheesman noted it there in April, Pitman in July to September, and Buxton in October. On the Diala R. at Bakubah however it again is common and a few occur at Shahroban. It occurs at Shush and on the Karun river and breeds there. It is absent from the Tekrit-Samarra district. The distribution is no doubt to some extent influenced by date groves.

It breeds at the end of April and beginning of May. Hobkirk found nests in holes in a bank on May 19th and 21st containing 5 and 4 eggs respectively. Armstrong found a nest at Fao on May 4th.

Five specimens examined : ♀, Kurna, 17-5-18 (P. A. B.); Akkarkuf, 20-8-17 (C. R. P.) ; ♀, Baghdad, 16-3-19 (P. Z. C. and R. E. C.); Kurna, 17-3-18 (?); ♂, Basra, 21-11-17 (C. B. T.). All are typical.

150. Common Roller. Coracias garrula. "Khundar."

1. *Coracias garrula semenowi,* Loud. and Tsch. (Orn. Jahrb. xiii, p. 148, 1902—Transcaspia).
2. *Coracias garrula garrula,* L. (Syst. Nat. Ed. x, p. 107, 1758—S. Sweden).

A common summer visitor whose numbers are increased at the times of migration by passage migrants through the country.

The first few appear in the first week of April but the general date of arrival is about the third week of the month, while many pass through in May, as Cumming records at Fao. Pitman noted small flocks at Feluja from April 4th to 30th, 6 to 12 in a flock migrating over going west or north-west and a similar migration was recorded at Basra at the end of the month.

It breeds commonly throughout our area, where conditions are suitable, from Mosul to Ahwaz ; but a few breed at Basra and none, probably due to lack of suitable sites, at Fao.

Cliffs of river banks are favourite sites and there are colonies on all the Mesopotamian rivers, the ruins of Babylon and the mounds of Shush are full of their nesting holes and occasionally holes in date palms are utilized as at Baghdad and Museyib. Pitman, who examined a large colony in the river bank at Feluja, found the nests in weather-worn holes and clefts 10 to 40 feet up and frequently near the top ; the entrance holes were large and the eggs were deposited on soft sandy soil not more than a foot in.

The excavation of holes begins at the end of April and fresh clutches are general by mid-May. Pitman, who examined two dozen nests on May 25th, found them to contain 3 to 7 eggs in various stages of incubation and one lot had hatched. In the middle of this colony a Kestrel also had its nest.

Some evidently move down from the hills to the plains as early as the end of July ; the numbers decrease at the end of August and early September, in which month most depart ; the last record is October 2nd. Cumming says they pass Fao on passage in September and October, they are few in number and only halt a short time.

(1) Seven specimens examined : ♀, Shustar, 3-5-17 (P. Z. C. and R. E. C.) ; ♀, Shahroban, 30-7-18 ; ♂ ♀, Amara, 2-5-18 (P. A. B.); Baghdad, 7-17; Hindeyeh Barrage, 2-7-17 ; Akkarkuf, 29-8-17 (C. R. P.).

(2) Mesopotamia, 23-4-17.

All belong to the eastern form *semenowi* except one which I cannot separate from the typical race ; Zarudny records *semenowi* as a passage migrant and the typical race as rare ; Weigold and Neuman record the latter race from Urfa and Ras-el-Ain. Our breeding race is certainly *semenowi* ; the typical race is presumably a passage migrant.

Semenowi in the adult spring plumage is rather indistinct; perhaps on the whole it is a trifle paler brown above and paler blue on the underparts and wing coverts.

In the juvenile dress however the differences appear to be much more distinct. Two juveniles from Sweden I have seen are very dark birds, from which the juveniles of *semenowi* can be picked out at a glance by their paler mantle and underparts.

There is no very marked difference in size between these two races, a series of the typical form measure 191-202 mm. and of *semenowi* 193-206 (once 212) (c. f. Hartert Vog. P. Faun., p. 873) I find *semenowi* in winter from Suakim, Khartoum and Parragani R. The adults moult before leaving the country, the young ones migrate in their juvenile dress.

151. Indian Roller. Coracias benghalensis.

Coracias benghalensis benghalensis, L. (Syst. Nat. Ed. x, 1, p. 106, 1758—Bengal).

The occurrence of the Indian Roller in Mesopotamia is very interesting as it is an example of a bird extending its range westward from India along the Persian Gulf. In Persia it is only found in the coastal parts and its distribution corresponds with that of the date palm. So too in Mesopotamia it is confined to the date palm area on the Shat-al-Arab ; from Fao to Basra it is fairly common, above Basra stragglers may be met with at Shafi and Nahr Umar, and Amara, above which there are no records ; nor are there any records on the Euphrates. Zarudny gives it as nesting in the Karun district, but this includes Mohommera where we know it occurs ; we have no records of it from higher up this river. Where it occurs it is quite resident.

It breeds at the end of April usually selecting a hole in a date palm, but Magrath notes nests also in walls in Basra. Young are out by the end of May and again at the end of July according to Tomlinson, so it probably breeds twice.

Two examples examined : ♀, Qalet Saleh, 6-1-18 (P. A. B.) ; Nahr Umar 25-3-18 (C. R. P.).

These quite resemble birds from Bengal.

152. Eagle Owl. Bubo bubo.

Bubo bubo ruthenus, But. and Zhitkov (Mem. Soc. Imp. Geogr. Russ. XLI, 2, p. 272, 1906—Simbirsk, Volga).

The Eagle Owl appears to be rare or perhaps very local in Mesopotamia and, may be, in the Jebel Hamrin is not so uncommon. It certainly occurs in the Tekrit cliffs where L. Home and Aldworth found it in pairs in January and obtained an egg laid on a shelf of the cliff ; Hobkirk saw one further up the river at Istabulat feeding young, and Meinerzhagen records one from the ruins of Babylon. Tomlinson took a small addled egg from a nest of a large unidentified owl at Ahwaz. A specimen was obtained at Shahroban in December 1918 and another at Sulemania by Ross. These and one in the British Museum labelled Mesopotamia from one of the old expeditions are the only skins available. These three skins resemble one another and also two skins from Trebizond, and I consider them to belong to the race *ruthenus*, a conclusion which Dr. Hartert, who kindly examined them also, independently came to. Sassi recording two birds from Mosul in January and February says he could come to no conclusion about them ; they did not belong to the typical race and approach *turcomanus* on the one hand and *nikolskii* on the other ; the wings measured 445 and 385 mm. respectively (unsexed). This latter race Zarudny described from the Jebel Tnüe in Arabistan (Orn. Jahrb., 1905, p. 142); it appears from his description to be a very small Eagle Owl (wing ♂, 378; ♀, 394 mm.), and our three Mesopotamian specimens cannot be this with wings (unsexed) 445, 457 and 465 mm. He says his *nikolskii* occurs as a resident in small numbers in the Zagros and Karun districts.

Without more material no one can possibly define the status of the race or races of this fine Owl in Mesopotamia, and so I leave all our records under *ruthenus*,

though *nikolskii* may also have to be accepted as a different form in the Karun area when specimens thence materialize.

(We have no records of any Fish-owl (*Ketupa*) occurring in Mesopotamia though it may do so in the Karun district, as Zarudny described a race *semenowi* from the Zagros, where it is common.)

153. Striated Scops Owl. Otus brucei. "Boomer." (All owls).

Otus brucei (Hume) (Stray Feathers, i, p. 8, 1872—Rahuri near Ahmednagar).

Cheesman found this owl in gardens with dense foliage of date and orange trees at Kazimain on March 29th where they were probably breeding, as a pair shot then had organs in an advanced state and the birds were still there on May 12th. Livesay found it common at Hilla and Museyib and obtained a specimen at the former place on July 13th, while eggs of a Scops of some species, very likely this, were brought in to him.

Cheesman notes that it takes insects on the wing and flies as fast as a bat ; it feeds before dusk, but it is not seen in the day time. The call is a short monotonous "boo-boo" resembling that of a Stock Dove. He says: "The note is quite different to that of *pulchellus* which I found breeding at Gulanak near Teheran in June 1917 where it was plentiful ; the note of this latter bird resembles the tinkling of a small brass bell and, as the birds seldom have exactly the same note, the combined effect of several is like an erratic peal of small bells ; the "boo-boo" of the Kazimain owl was not once heard there and *vice versa*. *Brucei* has also another note, a sort of squeak ; the Arabs say it breeds in holes in mulberry trees."

The Striated Scops Owl is probably resident where it occurs ; beyond the above records there is no certain information regarding its distribution in Mesopotamia ; it extends from India to Palestine.

Three specimens examined : Kazimain, 30-3-19 ; ♀ 29-3-19 (P. Z. C. and R. E. C.) ; Hilla, 13-7-16 (Livesay).

These match well a series from India, and the type specimen, in colour, size and wing formula.

154. Scops Owl. Otus scops.

Otus scops pulchellus, Pall. (Reiss. d. versch. Prov. Russ. Reiche 1, p. 456, 1801—Volga).

A Scops of sorts is recorded from Basra by Magrath, and Aldworth took a clutch of 3 Scops owl's eggs on May 3rd at Nasirijeh which Mr. Jourdain identifies as *pulchellus* (?).

The only certain records are of a bird obtained at Amara on April 11th and those of Cumming who met with it at Fao twice in October and once on April 22nd. The status of this owl requires further investigation and its breeding in Mesopotamia cannot be said to be proved.

This eastern race is not a very marked one and I am in doubt if the Mesopotamian birds belong to it or not. Further material is necessary to decide but for the time being I leave them under this race. According to Zarudny the typical race breeds in the Zagros.

155. Long-eared Owl. Asio otus.

Asio otus otus, L. (Syst. Nat. Ex., p. 92, 1758—Sweden).

Buxton states that one was shot by Capt. Downie at Amara on November 24th and that he examined it. Aldworth met with a party of 15 in palm groves at Nasarijeh on December 8th and secured one, and Livesay got one at Legait on April 21st. It must be a winter visitor.

156. Short-eared Owl. Asio flammeus.

Asio flammeus. (Pontopp.) (Danske Atlas. i, p. 617, 1763—Denmark.) =(*accipitrinus* auct).

Common winter visitor in suitable places and widely distributed. It arrives about the middle of September and leaves again towards the end of March ; odd birds were reported up to April 21st. It frequents crops, such as lucerne and young corn, desert scrub, grass lands and even bare desert ; and sometimes four or five may be flushed off the ground in close proximity. Magrath found it common round the Sanniyat position attracted by the small rodents which infested the trenches.

Specimens examined : ♀, Amara, 22-10-17. 0? 23-1-18. (P. A. B.). ♂, Kut, 20-2-17, 0 ? 19-2-17 (C. R. P.) ; Qalet Saleh, 25-11-17 (P. Z. C. and R. E. C.) ; Sulcimania, 1-1-20 (Ross).

I do not feel quite certain about the validity of the pale eastern race (*leucopsis*); one of the above (Qalet Saleh) only is a pale bird, the rest are as dark as west European examples.

There are seven other specimens in the B. M. from Mesopotamia mostly from Fao which Mr. Kinnear has kindly examined for me, three are light birds October and March and four are dark birds (one October and the rest bear no date). He remarks that there are in the Museum pale breeding birds from Siberia, but also a dark August bird, while one from France is as pale as any from Krasnoyarsk, and I may add I have an exceedingly pale bird from Norway.

157. Little Owl. Athene noctua.

Athene noctua bactriana, Hutt. (J. A. S. B. 16, p. 776, 1847—Kandahar).

The Little Owl is resident throughout Mesopotamia wherever there is suitable accommodation for it ; but it would seem to be commonest in the Samarra-Tekrit area where cliffs afford unlimited nest holes. In some places, as at Amara, they are not very common but even the oasis of Shaiba has its pair, which frequent the old mud fort. Elsewhere ruins, cliffs, brickfields, etc., are tenanted, and Pitman found one two feet down a rat hole in bare desert. Pitman notes that they begin calling at night at the end of January and pairing takes place early in February. Cheesman witnessed a fight between one of these owls and a pair of See-See for possession of a hole in a conglomerate cliff on April 19th, and though no eggs were found several were seen outside suitable holes in this cliff at Samarra. It is reported as breeding in the cliffs from Samarra to Tekrit in numbers. Like Little Owls elsewhere this race does not shun daylight and may be seen sitting near its hole even in the hot sun and often feeding in the daytime.

Eleven skins examined : Shaiba, 22-9-16 ; Samarra, 30-11-18, 19-4-19 ; Amara, 9-2-18, 4-2-18 (P. Z. C. and R. E. C.) ; Adhaim, 26-10-17, 22-10-17 (two) (C. R. P.) ; Amara, 26-10-17 (P. A. B.) ; Suleimania (Ross).

These vary somewhat in the colour of the upperparts even in the same locality ; they are too dark, not pale sandy enough above for *lilith* (from Palestine), and they certainly are not *glaux* (Egypt) and they match pretty well a series of *bactriana* from Kandahar ; the feathering on the toes varies ; *on the whole* these are less feathered than *bactriana* and more so than *lilith* but some are as fully feathered as the former usually is, while in two or three skins from Kandahar in winter the toes have little more than bristles on them. Apart from individual variation in colour, season also makes a difference and *bactriana* in spring is noticeably paler than in autumn. On the underside these Mesopotamian birds have the steaks not so yellowish-red as in *lilith*.

Zarudny records *glaux* from the Karun district and both *glaux* and *bactriana* as resident in the Zagros. Meinertzhagen says he saw *glaux* commonly at Babylon. From Mosul, Sassi records two as *bactriana* (?) and says the adult bird is quite like *glaux* ! Weigold identifies as *glaux* a mummied bird obtained in winter at Urfa while the type of *lilith* comes from the upper Euphrates at Der-ez-Zor (between Deir and Aleppo) and Hartert records this race form S. W. Persia !

In my opinion birds from Shustar in the south to Samarra in the north of our area are *bactriana*, what race really occurs in Northern Mesopotamia seems somewhat uncertain, I have seen no skins thence, but certainly none of our skins are *glaux*.

158. Barn Owl. Flammea alba. (=Strix flammea auct.)

Flammea alba alba, Scop. (Annus 1, Hist. Nat. p. 21, 1769—N. Italy).

Resident in small numbers throughout the area in suitable places. Wherever it occurs it probably breeds ; it is recorded in the breeding season from Samarra, Mosul, Babylon, between Museyib and Baghdad, Basra, and Fao, frequenting ruins, disused canals, chimneys, and old buildings. Livesay records taking a nest of 10 eggs between Museyib and Baghdad in April and Cumming records it as breeding at Fao in a loft.

One skin examined : Amara, 3-12-18 (P. A. B.) and two others in the B. M. Fao, February 1885, and Babylon-n. d.

All these three are similar and match British ones very well, they are pale yellowish, not at all grey on the back, and have very few spots underneath. A bird from Muscat in Arabia seems also to be like this race.

159. Peregrine Falcon. Falco peregrinus. "Shaheena."

1. *Falco peregrinus calidus*, Lath. (Ind. Orn., 1, p. 41, 1770—India).
2. *Falco peregrinus babylonicus*, Scl. (Ibis, 1861, p. 218-220—Oudh in India).

(1) A winter visitor in small numbers more especially frequenting inundations, etc., where wild fowl abound. The earliest record is September 22nd and the last in the first week of April ; it is distributed throughout our area.

Logan Home records one eating a Lesser Tern, while Cheesman writing about one he obtained at Baghdad notes the following debased habit : " These Falcons wait near the larger towns during winter's evenings and prey on the earlier bats. These fall easy victims, but occasionally one is missed and falls like a stone some twenty feet and then continues on ; the Falcons do not give chase but pass on to another bat, even small bats not being despised."

Four skins examined : ♂, Amara, 3-12-17, 14-3-18 (P. A. B.) ; ♀, Kazimain, 4-4-19 ; Baghdad, 7-11-18 (also two from Fao in B. M.).

The adults match *calidus* well with the broad white cheek patch ; two are young birds.

(2) Donald records that this Falcon (*sub. nom. F. barbarus*) is not uncommon at Basra and appears to be somewhat crepuscular in habits and sits on the ground about sunset, apparently watching for bats. Armstrong obtained a young female at Basra on December 15th. Magrath says it arrives with the ducks. Sassi records it from Mosul on June 10th.

160. Lanner Falcon. Falco biarmicus.

Falco biarmicus tanypterus, Schleg. (Abh. Geb. Zool. u. vergl. Anat., 2. Hefte, 3, p. 8, 1844—Nubia).

One obtained by Cumming at Fao on August 30th is in the British Museum. It was recorded by Sharpe as *feldeggii* in the Ibis. 1891, p. 104.

161. Saker Falcon. Falco cherrug.

1. *Falco cherrug cherrug*, Gray (Hardw. III, Ind. Zool. 1833-34—India).
2. *Falco cherrug milvipes*, Jerd. (Ibis. 1871, p. 240—Umballa, Punjab).

Cherrugs are fairly common winter visitors ; they were noted by Buxton at Amara, at Samarra by Pitman, while Cheesman also noted a good many near Baghdad in November sitting on telegraph poles. Donald records that he saw

one strike a Sand-grouse near Sheik Saad, but it had to give up its prey to a Steppe Eagle. All except one from Ahwaz belong to the typical race.

(1) Specimens examined ♂, Amara, 1-12-18 (P. A. B.); ♀, Baghdad, 26-12-17 (Ingoldby); ♀, Samarra, 30-11-18 (P. Z. C. and R. E. C.).

(2) ♂, Ahwaz, 12-2-18 (F. M. B.).

162. Hobby. Falco subbuteo.

Falco subbuteo subbuteo, L. (Syst. Nat. Ed. x, 1, p. 89, 1758—Sweden).

A fairly common passage migrant arriving in the last week of April and passing on by the middle of May; it reappears in the first week of October and has gone further south by the end of the month. It is partial to the date groves. Pitman thinks he saw this species at Museyib in June and July and thought it might breed there; further evidence on this however is required.

Three specimens examined: ♂, Amara, 1-5-18 (P. A. B.); ♀, Azizieh, 16-10-18 (P. Z. C. and R. E. C.); ♀, Amara, 18-4-17 (L. Home).

These match European specimens in the colour of the upper parts; wing ♂, 256. ♀, 280 mm.; European birds vary a good deal in the depth of colour of the mantle and in length of wing. Buturlin's race *centralasiæ* from Tian-shan wants further examination; it seems a little doubtful.

163. Merlin. Falco æsalon.

1. *Falco æsalon pallidus* (Suschk.) (Bull. B. O. C. 11, p. 5, 1900—W. Kirghis steppes).
2. *Falco æsalon insignis*, Clark. (Proc. U. S. Nat. Mus. 32, p. 470, 1907—Fusan in Korea).

The Merlin, of which two races occur in Mesopotamia, is a winter visitor in small numbers; the earliest date of arrival is September 24th and the last date May 5th. It is distributed throughout our area hunting in open spaces, particularly crops, for Crested Larks and such small birds.

Three skins examined: (1) ♀, Amara, 23-1-18 (P. A. B.); ♂ Amara, 13-3-19 (Aldworth).

These two belong to the very pale form *pallidus*, the adult of this race is a most beautiful pale blue grey above, shades paler than the west European form; the young are also a much paler rufous brown.

Wings, ♂ 207. ♀ 231 mm.

(2) Khamiseyah, 25-11-16 (Aldworth).

This is not as pale as *pallidus* and yet it is paler than the west European bird, and matches well examples of *insignis* from Turkestan and China. Wing 204 mm.

164. Lesser Kestrel. Falco naumanni.

Falco naumanni naumanni, Fleischer (Sylvan, 1818, p. 174—S. Germany).

Fairly common summer visitor and passage migrant; Buxton says it passes through Amara during the last three weeks of April; Pitman at Feluja noted flocks passing over at intervals from April 8th, twenty to thirty birds in a flock; while on May 5th he saw numbers of what he thought were this species nesting in an elevated ruin 10 miles south of Feluja. Weigold records it as a very common and breeding at Urfa, and Sassi notes it at Mosul on May 2nd. There are no autumn records, except at Baghdad in the first 10 days of October.

Seven specimens examined: ♂♀, Amara, 23-4-18: Baghdad, ♂, 11-10-17 (P. A. B.); Feluja, ♀, 8-4-17; ♀, 9-4-17 (two) ♂, 16-4-17 (C. R. P.).

165. Common Kestrel. Falco tinnunculus.

Falco tinnunculus tinnunculus, L. (Syst. Nat. Ed. x., 1, p. 90, 1758—Sweden).

As far as can be ascertained the Kesrrel is resident in Mesopotamia, breeding at all events from Mosul south to the Babylon district, and in the Karun foothills, spreading out in winter over the rest of the country and perhaps augmented by

winter visitors from elsewhere. In the cliffs bordering the upper parts of the Tigris from Fatah Gorge to the Samarra district and on the Euphrates near Feluja, it is reported as being an abundant breeding species ; elsewhere ruins are occupied and at Museyib Livesay found two nests containing 7 eggs each, in each case an old Magpie's nest being utilized. Pitman records that they were pairing off at the end of February at Samarra where every ruin had its pair ; he found a nest of young in the middle of a Roller colony at Feluja on May 25th. Logan Home found eggs at Tekrit between April 4th and May 15th.

From Baghdad and Babylon southwards it appears to be a winter visitor as we have no nesting records ; Buxton at Amara says it arrives at the end of September and leaves by the first week in April. In the Shustar district however it is a breeding species.

Nine skins examined : ♂, Bait-al-Khalifa, 30-1-18 ; ♀, Adhaim, 4-11-17 (C. R. P.) ; ♂, Baghdad, 14-1-19; Amara, 21-12-17; Sheik Saad, 22-3-17 (P. Z. C. and R. E. C.) ; ♂, Amara, 1-11-17, 29-10-17, 23-12-17 (P. A. B) ; ♂, Hit, 7-4-18 (Ludlow).

Wings ♂ 230-250. ♀ 247-271 mm.

These agree well with European birds, whose mantles vary much in shade of colour.

166. Imperial Eagle. Aquila heliaca.

Aquila heliaca heliaca, Sav. (Desc. Egypte. Syst. Ois., p. 82, 1809—Upper Egypt).

Very few Eagles of any sort were obtained and many records of various Eagles have had to be omitted as being unreliable as to the species. Eagles are not uncommon in Mesopotamia, all, except Bonelli's and the White-tailed, being, so far as we know, winter visitants.

The Imperial Eagle is recorded by Mr. Donald twice in October near Basra and once near Sheik Saad where he saw one stooping at a hare. Logan Home noted it near Gurmat Ali on August 8th. Zarudny records it in winter in the Karun district ; Meinerzhagen records it from the Tigris in winter. Cheesman obtained one at Beled on March 4th ; it had been feeding on stale sheep's "lights".

167. Tawny Eagle. Aquila rapax.

Aquila rapax albicans, Rüpp. (Neue Wirbelt. Vög., p. 34, 1835—Simen Prov. in Abyssinia).

There are no records which can safely be put down to this species ; perhaps it is not uncommon as Pitman obtained one at Kut and Logan Home one at Basra. Wings 520 and 525 mm. Mr. W. L. Sclater, who has recently been working at this group, kindly identified these for me as belonging to this race.

168. Steppe Eagle. Aquila nipalensis.

Aquila nipalensis orientalis, Cab. (J. F. O., 1854, p. 369—Volga).

Fairly common winter visitor in the marshes round Amara and presumably elsewhere ; last seen April 7th. Mr. Donald records seeing one rob a Saker of a Sand-grouse. Buxton obtained one at Kurna on March 17th, 1918, and Cheesman got one, sitting on a desert mound at Beled, on March 1st, 1919, it had been feeding on stale chicken; another near Zoar on April 30th, where he saw two pairs. Zarudny records both this, the western race, and the eastern typical race *nipalensis* from the Karun district in winter as well as a race, *glitschi*, which according to Hartert is a synonym of *orientalis*.

I am indebted to Mr. Sclater for identifying these two specimens.

169. Greater Spotted Eagle. Aquila maculata.

Aquila maculata (Gm.) (Syst. Nat. I, i, p. 258, 1788—Europe).

One recorded at Basra by Mr. Donald at the end of November, and one seen at close quarters at Amara by Buxton on November 2nd. One was obtained at Baghdad on December 28th by Cheesman.

Meinertzahagen records it from the marshes near Kurna and at Tekrit. Probably not uncommon. Cumming obtained one at Fao and there are three specimens in the B. M. from Baghdad collected by Loftus.

170. Golden Eagle. Aquila chrysaëtus.

Zarudny records the Golden Eagle, under the name of *fulva*, from the Karun district in winter and says it nests in small numbers in the Zagros. No other records.

171. Bonelli's Eagle. Hieraetus fasciatus.

Hieraëtus fasciatus fasciatus (Vieill.) (Mem. Soc. Linn. Paris 2, 2 p. 152, 1822—Montpellier in S. France).

Bonelli's Eagle appears to be fairly common and resident in at all events the Tekrit area; probably it spreads out in winter to other parts of the plain. Aldworth found four or five pairs breeding within a range of twenty miles in the Tekrit area. The first nest contained a single egg on February 19th, the nest placed on a cliff, and built of sticks was very flat, like a huge Sparrow Hawk's nest, except that it was lined with grass. Nearly three weeks later a second egg was taken from the same nest. A second nest in the area contained two eggs on March 12th ; the female was shot for identification. Zarudny lists it for the Karun district in winter. Meinerzhagen says the Arabs prize it for gazelle hawking.

172. Booted Eagle. Hieraëtus pennatus.

Hieraëtus pennatus (Gm.) (Syst. Nat. I, i, p. 272, 1788—France ?).

Weigold records this as the commonest large bird of prey at Urfa and several observers thought they saw it commonly in our area. No skins obtained, but there are three from Fao in the British Museum obtained by Cumming.

173. Sea Eagle. Haliaëtus albicilla.

Haliaëtus albicilla (L.) (Syst Nat. Ed. x, 1, p. 89, 1758—Sweden).

This fine Eagle is resident and breeds in the Tekrit area and is not uncommon : to the rest of the Mesopotamian rivers and inundations it wanders in winter. Aldworth found three pairs breeding in the cliffs at Tekrit by the river. The first nest held two eggs on January 28th ; another nest had two hard set eggs on February 3rd, and the third two fresh eggs on February 8th ; these nests were all in caves in the face of the cliffs about 30 to 50 feet from the top and were lined with tufts of grass. The bird whose egg was taken on January 28th was sitting again on March 1st. An old female shot from the nest had the whole bill *yellow* ; iris pale yellow ; tarsi pale, bright yellow.

This Eagle also breeds at Birejik on the Euphrates beyond our area, whence, Mr. Parkin has a clutch of three eggs.

174. Pallas' Fish Eagle. Haliaetus leucoryphus.

Haliaëtus leucoryphus (Pall.) (Reise. d. versch. Prov. Russ. Reichs I, p. 454, 1771—S. Russia).

Several observers recorded single birds over the rivers and inundations during the winter. Zarudny also records it in winter.

No skins obtained.

175. Steppe Buzzard. Buteo buteo.

Buteo buteo anceps, Brehm. (=*desertorum* auct.) (Naumannia, 1855 p. 6—Blue Nile).

Observed by Cumming at Fao as a passage migrant and winter visitor, he obtained three specimens in the first fortnight of September when they were passing in great numbers.

No specimens were obtained by any of our observers and therefore statements concerning its presence in winter need verification.

Weigold obtained one at Djullab on April 23rd and Neumann records one from Ras-el-Ain on July 30th, and remarks on the coloration of the tail of this specimen which, instead of being red-brown, was iron grey with nine sharp black cross bands. From the date it was obtained he says it must have bred there, an assumption I consider entirely unwarrantable, as the date is not too early for odd migrants (see under Black Kite) or indeed it may have been a non-breeding individual ; were one to accept the presence of a single bird of any species at the end of July as evidence of that species breeding in the locality, some very curious and very erroneous statements would occur in Ornithology.

The status of this Buzzard in Mesopotamia requires further investigation.

176. Long-legged Buzzard. Buteo ferox. "Nisr."

Buteo ferox ferox (Gm.) (Nov. Comm. Acad. Petropol. 15, p. 442, 1771—Astrachan).

In most parts this Buzzard is a common winter visitor arriving at the end of October and leaving again at the end of March. It should be familiar to most by its great diversity of plumage and its habit of perching on any upstanding thing such as a telegraph post, old wall, brick-kiln, etc., but many of the records have unfortunately to be discarded as they were evidently mixed up with other species. It seems certain that this species nests in the Tekrit area where Cheesman found a nest in the cliffs ; Logan Home also records a pair nesting there at the end of March, when he obtained a clutch of two eggs and saw several pairs building at the end of February .

Cheesman obtained one at Hindia Barrage on March 22nd with organs advanced. Sassi records it from Mosul on June 2nd.

Nine specimens examined :—♂, Samarra, 20-2-19 ; ♂, Amara, 4-12-17; ♂, Hindia Barrage, 22-3-19 (P. Z. C. and R. E. C.); ♀, Legait, 28-11-16 (Livesay), Sheik Saad, 12-17 (Ingoldby); Kut, 27-10-16 (C. R. P.) ; ♀, Amara, 13-1-18 ; ♂ ♀, Ezra's Tomb, 23-2-18 (P. A. B.).

177. Pallid Harrier. Circus macrourus.

Circus macrourus (Gm.) (Nov. Comm. Acad. Petropol., 15, 1770, p. 439, 1771—Voronez in Russia).

A common winter visitor throughout our area ; first noted on September 12th but most arrive in October ; the majority leave during March but there are records up to April 13th. It is found wherever suitable country occurs such as scrub, grassy plains, crops, etc. Brooking records it taking a "Paddy Bird" at Ramadi and, more than once, Pigeons of the Carrier Service. Sassi records it at Mosul on April 25th and Neumann from Ras-el-Ain as early as August 8th.

Six specimens examined :—♂, Amara, 14-2-18 ; Sheik Saad, 8-12-16 (P.Z.C. and R. E. C.); ♂, Amara, 1-17 ; Kumait, 2-17 (P. A. B.); Mesopotamia (Perreau), Kut, 6-1-17 (C. R. P.).

178. Montagu's Harrier. Circus cineraceus

Circus cineraceus (Mont.) (Orn. Dict., 1802—Wiltshire).

Various other Harriers are recorded as being observed such as *cyaneus*, which may occur, and *melanoleucus* which is unlikely to ; however it seems almost certain that Montagu's Harrier does occur, Zarudny records it in winter in the Karun district and several of our observers record it, noting that its appearance and disappearance and habits are much the same as those of the Pallid Harrier. No skins however were obtained.

I hesitate to include the Hen Harrier as I am very doubtful if one can be certain of it on the wing and the Pallid Harrier is so common. Several observers state they saw it in winter, but no specimens are forthcoming.

It is possible a Harrier of sorts breeds in the Tekrit area as Logan Home records one (under *cyaneus*) as common from April to June at Samarra, and remarks that it must be breeding. The status of the various Harriers requires further investigation.

179. Marsh Harrier. Circus æruginosus.

Circus æruginosus æruginosus (L.) (Syst. Nat. Ed. x, 1, p. 91, 1758—Sweden).

The Marsh Harrier is very abundant and resident in the huge marshes of the plains, such as the Euphrates marshes near the Hindia Barrage, and the Hamar lake and elsewhere. Logan Home noted it also in the Samarra district in April to June wherever there was long lank grass. In the marshes, near Basra, where it also breeds, it was observed building on March 22nd and Buxton also saw it carrying, as nest material, pieces of reed at the Hamar lake on May 25th. Five nests were found by Livesay in the Hindia marshes on June 2nd containing two eggs (two); three eggs, and two with young.

Nine skins examined :—♂, Amara, 11-2-18, ♀, 16-12-17, 7-2-18, 17-2-18, ♂, Baghdad, 31-3-18, ♀, L. Akkarkuf, 12-10-17 (two) (P. A. B.). Amara 16-1-18 (P. Z. C. and R. E. C.); L. Akkarkuf, 18-8-17 (C. R. P.).

These agree well with European specimens ; they are not glossy or nearly black on the upper parts as in the Algerian form *harterti* ; the coloration of the crown varies, in October it is rusty cream to creamy white, in February dirty white. Naumann was inclined to think that one he examined from Ras-el-Ain might be *harterti* as it had a pure white crown and the mantle somewhat darker than in European birds ; I can however not see any difference between this series of Mesopotamian birds and European ones.

Two of Buxton's are adult males with streaked heads and silvery blue on wings and tail. A female, he noted, had a double ovary.

180. Sparrow Hawk. Accipiter nisus.

1. *Accipiter nisus nisus* (L). (Syst. Nat. Ed. x, 1, p. 92, 1758—Sweden).
2. *Accipiter nisus nisosimilis* (Tick.) (J. A. S. B., ii, p. 571, 1833-4—Borabhum, India).

Fairly common winter visitor, recorded throughout the area, it arrives at the end of October and most have gone by the end of March. Pitman records it from Feluja on April 17th and Sassi at Mosul on the 27th ; Pitman says he saw it in the date groves at Museyib in June and July and supposed it was breeding : this record as in the case of the Hobby, needs further confirmation, but it seems probable that some small hawk must nest there. Brooking has recorded that this species breeds at Ramadi.

(1) Seven skins examined : ♀, Amara, 25-1-18, 1-12-17, ♂, 23-11-17 (P. A. B.); ♀, Abed. 9-2-18 (F .M. B.); ♀, Feluja, 17-4-17; (two) ♂, Amara, 4-2-18 (P. Z. C. and R. E. C.)

Wings ♂, 201, 201, ♀, 227-239 ; I cannot separate any of these on colour, and their wings fall within the measurements of the typical race.

(2) ♀, Amara, 3-3-18 (P. A. B.); ♀ Samarra, 29-1-18.

These two specimens with wings of 243 and 246 mm. are much larger than any of a large series of European birds I have measured and must I think be assigned to this widely distributed eastern race. Probably in small numbers a winter visitor.

181. Levant Sparrow Hawk. Accipiter brevipes.

Accipiter brevipes (Severtz.) (Bull. Soc. Imp. Nat. Moscow, 23, 2, p. 234, 1850—Voronesh, S. Russia).

Recorded as seen almost daily in April at Urfa at Weigold. Zarudny gives it as a winter visitor and passage migrant. It must occur fairly commonly, but we have no records or specimens.

182. Black Kite. Milvus migrans.

Milvus migrans migrans, Bodd. (Tabl. Pl. Enl., p. 28, 1783—France).

A winter visitor to the plains, arriving early ; the earliest record is July 26th near Baghdad and but few are seen till mid-August when they appear in some places in numbers; many are recorded at Fao on the 18th, Basra on the 20th ; to some places no great numbers are seen till well on in September as at Baghdad, while throughout the country they become increasingly common during October and remain common during the winter. They begin to leave again in March and few are left by mid-April ; odd non-breeding birds are recorded on June 1st.

Weigold records it as common and breeding at Djullab on the Syrian frontier (or actually in Syria ?). Cheesman saw a large flock roosting in date palms at Khanikin on the Persian frontier on May 21st but its status there is not known.

Attracted by food it swarmed round the larger camps and even followed troops on manœuvres and is very common in the larger towns, as at Basra, where it competed with the gulls in scavenging the river for floating morsels. There is no truth, of course, in the widespread idea held during the war that the kites were imported from India to act as scavengers ! It was remarked that these kites were commoner in 1917-18 than in 1916-17, probably due to the increased number and extent of camps, dumps, etc. Several were killed by anti-aircraft fire. Stoneham records it roosting on bare ground in lieu of trees.

Six specimens examined : ♂, Shaiba n. d., ♀, Sheik Saad, 1-11-16, 14-9-16 (P. Z. C. and R. E. C.); ♀ Sheik Saad, 12-12-17 (Robinson). ♀, Baghdad, 13-9-17; ♂, Qizil Robat, 22-11-18 (P. A. B.).

These match European birds in similar plumage ; the edging to the crown feathers not rufous, but creamy white.

The name *Korschun* of Gmelin has been resuscitated of recent years by some authors for this bird, but this name is invalid, as pointed out by Newton many years ago. It seems a pity that, before old names are brought forward to replace well known names on the plea of priority, their correctness is not more carefully gone into.

183. Large Black Kite. Milvus lineatus.

Milvus lineatus, Gray (Hardwicke's Ill. Zool. I, p. 1, 1832—China).

The status of this bird, except that it is presumably a winter visitor, is not known. Zarudny records it as rare in winter in the Karun district. Buxton obtained a pair on December 25th, 1917, which I regard as belonging to this species ; the black streaks on the crown are not edged with creamy white but with rufous brown, as in *govinda*, they are also large birds (wings ♂ 455 ♀ 485 mm.) and there is a considerable white patch at the bases of the flight feathers. Possibly it is commoner than the records indicate but was confused with *migrans*.

This bird is the *Milvus melanotis* of the Fauna of British India.

184. Red Kite. Milvus milvus.

Milvus milvus milvus (L.) (Syst. Nat. Ed. x, 1, p. 89, 1758—Sweden).

Recorded by Zarudny as a passage migrant in the Karun district. No other records.

185. Honey Buzzard. Pernis apivorus.

Pernis apivorus apivorus (L.) (Syst. Nat. Ed. x, 1758—Sweden).

Apparently a passage migrant and not common. Cumming obtained specimens at Fao on September 22nd, 1884, and September 23rd, 1886. These are in the British Museum.

186. Osprey. Pandion haliaetus.

Pandion haliaëtus (L.) (Syst. Nat. Ed. x, 1, p. 91, 1758—Sweden).

A winter visitor to the larger rivers and swamps of the plains where it is not very uncommon. Single birds are recorded on May 18th and July 5th but there is no evidence that it breeds in our area ; as elsewhere doubtless a few non-breeding birds spend the summer. It breeds on the island of Tanb in the Persian Gulf, though of course this is nowhere near Mesopotamia.

Cheesman obtained one at Shaiba oasis, 8 miles from the nearest water, it had frequented a tall pole for roosting on for some time. Buxton got one at the Hamar lake on May 20th.

187. Griffon Vulture. Gyps fulvus.

Gyps fulvus fulvus (Habl.) (Neue Nerdische Beytr. iv, p. 58, 1783—Gilan, Prov. of Persia).

A non-breeding visitor to the plains in small numbers and widely distributed.

This is the big dark Vulture recorded by many observers ; small parties were generally met with feeding at some dead animal, or roosting on the tops of palm trees. It probably breeds in the hills of Kurdistan and may do so in the Jebel Hamrin; Logan Home thought it might even breed in the cliffs of Tekrit but, we have no definite evidence of it. Zarudny says it is resident in the Zagros and breeds also in the Karun area. It appeared to be commoner in the parts nearer the foot hills, as in the Samarra-Tekrit area, than away in the plains lower down. It is recorded in most months of the year and probably some non-breeding birds spend the breeding season in the plains.

Many were seen haunting the old battlefields round Azizieh and parties of 20 to 50 are noted at other places attracted by dead animals, such as at veterinary dumps.

Specimen examined : One skin : July 1917 Kanikin (P. A. B.)

(Pitman on several occasions at Samarra and below Baghdad on the Tigris thought he saw *monachus*, the King Vulture, but further confirmation is advisable, though it is likely to occur.)

188. Lämmergeier. Gypaetus barbatus.

Magrath records that he saw an undoubted Lammergeier near Ali Gharbi on May 16th and remarks that the Jebel Hamrin range is but 20 miles from there, whence presumably the bird had come, or more probably from the Pusht-i-Kuh Mts. distant about 35 miles in direct flight. Weigold also records a straggler at Urfa on April 20th, which must have wandered still further from its home.

The race inhabiting Kurdistan is presumably *grandis*.

189. Egyptian Vulture. Neophron percnopterus.

Neophron percnopterus percnopterus (L.) (Syst. Nat. Ed. x, 1, p. 87, 1785—(Egypt).

It is somewhat surprising that Vultures should be so scarce in Mesopotamia considering the plentiful supply of dead animals there was during the war, and it would seem that no increased numbers were induced to visit the country on this account, quite the reverse to the experiences of earlier Afghan campaigns when species such as *Pseudogyps bengalensis*, not usually found in Afghanistan followed the armies hundreds of miles away from their normal habitat.

This vulture, the least rare of those which occur, cannot be said to be really common anywhere ; it is resident, or practically so, breeding in the Jebel Hamrin range ; some move down to the plains in the non-breeding season and others remain in the plains all the year as non-breeding birds. It is widely distributed in quite small numbers, single birds or twos and threes being the usual thing.

Tomlinson records it as common at Ahwaz where he found three nests in April ; Cheesman found it nesting on a ledge of a cave at the Maidan-i-Naptun oil-fields on Monday 20th.

(To be continued.)

SCIENTIFIC RESULTS OF THE MAMMAL SURVEY.

No. XXXII.

(A.) NEW AND INTERESTING MAMMALS FROM THE MISHMI HILLS,

BY

OLDFIELD THOMAS, F.R.S.

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In a fine collection of mammals from the Mishmi Hills made for the Survey by Mr. H. W. Wells there occur the following forms worthy of special note. A full report on the collection will appear later.

Tupaia belangeri versuræ, subsp. n.

Near *T. b. assamensis*, Wrought., in general colour, but the fur longer, the shoulder stripes more diffuse—in fact scarcely perceptible, and the buffy ends of the hairs of the chest and middle line of belly more strongly ochraceous. Hairs of inguinal region dull buffy with slaty bases, these hairs being wholly buffy in *assamensis*.

Skull as usual in *belangeri*.

Dimensions of the type, measured in the flesh :—

Head and body 199 mm. tail 184 mm., hindfoot 43·5 mm., ear 20 mm.

Skull, greatest length 49 mm., zygomatic breadth 25 mm.

Hab.—Mishmi Hills. Type from Dening, 2250′.

Type.—Adult male B. M. No. 21. 12. 5. 9. Original number 1629.

Collected 3rd April 1921, by H. W. Wells. Presented by the Bombay Natural History Society.

This Tree Shrew of the far North-eastern corner of British India differs from that of the rest of Assam in a curiously similar manner to that in which *Dremomys l. subflaviventris* does from *D. l. garonum*, for the buffy of the undersurface is here ochraceous as compared with yellowish exactly as in the corresponding races of the squirrel from the same two areas.

The only other form that comes in question is *T. b. chinensis*, and on the basis of our Teng-yue specimens of the latter, the Mishmi specimens are distinguishable by their much darker general colour, and their ochraceous-washed undersurface.

In working out this Tree-shrew I have again examined the form found in Sikkim, which has been long known, but has hitherto been vaguely assigned to *T. belangeri belangeri*, whose type locality is Pegu.

Now that better series are available, it is natural to find that the Sikkim form deserves a special name, and it may be called—

Tupaia belangeri lepcha, subsp. n.

Size rather less than in the average of *belangeri*. General colour olivaceous grey, paler than in *assamensis* and *versuræ*, the back without any brownish or rufous tone such as is found in subspecies *belangeri*. Shoulder stripes scarcely perceptible. Chest and middle line of abdomen washed with pale buffy, about as in *assamensis*, paler than in *versuræ*.

Dimensions of the type, measured in the flesh :—

Head and body 154 mm., tail 173 mm., hindfoot 40 mm., ear 16 mm.

Skull, greatest length 46 mm., condylo-basal length 44 mm., zygomatic breadth 24 mm.

Hab.—Sikkim and Bhutan. Commonly recorded also as from Nepal, but this appears to have been based on Hodgson's later specimens, which were from Darjiling and not Nepal. Type from Narbong, Darjiling, 2000′.

Type.—Adult female. B. M. No. 15.9.1.44. Original number 6467. Collected 14th March 1915 by C. A. Crump. Presented by the Bombay Natural History Society.

Hitherto always referred to *T. belangeri belangeri*, but clearly subspecifically distinguishable.

Soriculus radulus, sp. n.

A small species with large fore-claws :—

Size a little larger than in *S. caudatus*. General appearance much as in that species, though the tail is shorter. Fur fine, soft, velvety, hairs of back about 4·5 mm., in length. General colour velvety blackish, a little browner than " blackish mouse-grey ". Undersurface dark smoky brown. Hands and feet almost naked, dark grey ; claws markedly elongated, fossorial, the fore-claws attaining 3·5 mm., in length, as compared with 2·0 in *S. caudatus*. Tail about the length of the body without the head, naked, black, scarcely lighter below.

Skull rather larger than that of *S. caudatus*, and proportionately broader across the braincase. Teeth much as in *caudatus*, the second incisor similarly larger than the third, not as in *nigrescens*, the other species with elongated claws. Tips of teeth with a minimum amount of brown, i^1, i^2, and p^4 alone being slightly darkened terminally.

Dimensions of the type, measured in the flesh :—

Head and body 70 mm., tail 50 mm., hindfoot 14 mm., ear 9 mm.

Skull, greatest length 20·6 mm. ; condylo-incisive length 21·1 mm., breadth across braincase 10·5 mm., upper tooth series 9·7 mm.

Hab.—Mishmi Hills. Type from Dreyi 5,140′.

Type.—Adult female. B. M. No. 21. 12. 5. 6. Original number 1947.

Collected 28th May 1921 by H. W. Wells. Presented by the Bombay Natural History Society. A second specimen preserved in spirit.

This little shrew is at once distinguished by its long claws from any other members of the genus except *S. nigrescens*, and that is very much larger, with differently proportioned incisors.

The collection also contains four examples of *S. caudatus*, but not any of the other Mishmi species, *S. baileyi*, described by me in 1914.

Dremomys lokriah subflaviventris, Horsf.

Most nearly allied to *D. l. bhotia*, Wrought., with which it shares the dark greyish general colour above, without fulvous suffusion. But the size is larger, the skull sometimes attaining 54 mm. in length, and the ochraceous colour of the undersurface is more nearly restricted to the median area. In *bhotia* the whole undersurface from side to side is more or less washed with ochraceous, the fulvous tinge often perceptible on the flanks. In *subflaviventris* on the other hand the ochraceous is even more vivid on the chest and middle area of the belly, but is usually only about 25-30 mm. wide, the sides of the belly being olivaceous grey like the flanks and back.

Dimensions of a Mishmi specimen, measured in the flesh :—

Head and body 201 mm., tail 125 mm., hindfoot 45 mm., ear 20 mm.

Skull, greatest length 52·5 mm. ; condylo-incisive length 47 mm., zygomatic breadth 29·7 mm., upper tooth series exclusive of p^3 8·5 mm.

In connection with the determination of this animal an interesting point of nomenclature arises. The name *Sciurus subflaviventris* has always been considered as a *nomen nudum*, and it certainly has never been " properly " described. But it is now considered that any statement about a specimen, in connection with a name, renders the latter valid. Now two statements have been made about *subflaviventris*, the first of which, dating from Horsfield's catalogue†, may be taking as stabilizing the name, with its type, B. M. No. 79.11.21.351. The statement is simply that *S. subflaviventris* " nearly resembles " *S. lokriah*, and we may therefore consider the type as having been described. A full description of the same animal was given by McClelland, P. Z. S., 1839, p. 151, but only in connection with the earlier name of *lokriah*, Hodgs.

The advantage of accepting this early statement as valid is that a still more unsatisfactory but an unescapable statement has recently been made about *sub-*

† Horsf. Cat. Mamm. Mus. E. I. C. p. 153, 1851.

flaviventris by Robinson and Kloss, Records Ind. Mus., XV., p. 236, 1918, who say of a number of specimens from different localities, covering the ranges of two quite different forms, that " these specimens, which are more ochraceous and less ferrugineous than most specimens from Nepal, have been referred to in literature as *S. subflaviventris.*" That statement would again (if it had not been antedated by Horsfield's) be a valid " description " of *subflaviventris*, but would remove the name from McClelland's type, and base it on a mixture of specimens from several localities.

Now the type of " *S. subflaviventris*, McCl. " Horsf., has absolutely the pectoral colour of true *lokriah*, not that of the subspecies next to be described and must therefore have been originally obtained in the North Eastern part of " Assam." And in size of skull it entirely agrees with the form of the Mishmi Hills. Persons who do not accept my extreme view of what is to be taken as a " description " would equally reject Robinson and Kloss's one as being valid, for it also was imperfect and unintentional and they should then accept the name from the present paper.

The definite identification of this troublesome name is undoubteldy an advance in clearing up the synonymy of the group.

In working out this *Dremomys*, the distinction from it of the Garo and Khasi Hills form now comes to light. The latter is clearly a separate subspecies, and may be called

Dremomys lokriah garonum, subsp. n.

Size about as in true *lokriah*, or slightly smaller. Colour above as in *D. l. bhotia*, but below instead of the yellowish wash approaching " orange ochraceous " as it does in *lokriah*, *bhotia* and *subflaviventris*, it is far paler and more yellow, nearly matching Ridgway's " orange-buff ". Buffy of underside narrowed below, as in *subflaviventris*, not as in *bhotia*.

Dimensions of the type, measured in the flesh :—

Head and body 190 mm., tail 153 mm., hindfoot 45 mm., ear 20 mm.

Skull, greatest length 50·5 mm., condylo-incisive length 44·2 mm., zygomatic breadth 27 mm. ; upper tooth series, exclusive of p^3 8·5 mm.

Hab.—Garo and Gaintia Hills, Assam. Type from Tura, Garo Hills. Another specimen, apparently similar, from Rajapara, S. Kamrup, on the Northern side of the Brahmaputra.

Type.—Adult male. B. M. No. 21.1, 6.54 Original number 283. Collected 25th February 1920 by H. W. Wells. Presented by the Bombay Natural History Society. Five specimens.

Readily distinguishable by the paleness of its lower surface.

Dacnomys wroughtoni, sp. n.

A larger species than *D. millardi*, of warmer coloration.

Size, as gauged by skull, decidedly larger than in *millardi*, though the feet are but little longer, their range of variation overlapping the foot-length of the single known specimen of *millardi*. General colour of upper surface a strong warm brown, near " Prout's brown, " the ends of the ordinary hairs deep buffy. On the other hand *D. millardi* is a colder and more greyish or smoky brown, the light ends of the hairs inconspicuously drab. Undersurface lighter than upper but still usually of a warmer tone than in *millardi*, gular, axillary, and inguinal whitish patches usually absent, but present, quite as well developed as in the type of *millardi*, in one out of six specimens. Ears practically naked, brown. Hands brown on metacarpus, the digits lighter. Feet rather stouter than in *millardi*, similarly brown with lighter ends to the toes. Mammæ 2-2=8.

Skull similar in essential respects to that of *millardi*, but considerably larger, and the prominent supraorbital ridges heavier throughout, with the angular postorbital projections more conspicuously developed.

Hab.—Mishmi Hills. Type from Dreyi ; alt. 6,000′.

Type.—Adult male. Teeth worn. B. M. No. 21. 12. 5. 84. Original number 1999.

Collected 9th June 1921 by H. W. Wells ; presented by the Bombay Natural History Society.

Dimensions of the type, measured in the flesh ;—

Head and body 290 mm., tail 335 mm., hindfoot 56 mm., ear 27 mm. Weight 1·25 lbs.

Skull, greatest length 62 mm., condylo-incisive length 57·7 mm., zygomatic breadth 30 mm., nasals 24×7·3 mm. ; interorbital breadth 8·8 mm. ; breadth across postorbital projections 19·2 mm. ; zygomatic plate 5·6 mm. ; palatilar length 29·3 mm. ; palatal foramina 12 × 5 mm. ; upper molar series 13.

This fine rat forms a second species of the genus *Dacnomys*, the discovery of which forms one of the most striking results of the Bombay Natural History Society's Survey. The original species having been named in honour of Mr. Millard, I have thought it suitable that the second should bear the name of his friend and partner in the carrying out of the Bombay Survey, the late Mr. R. C. Wroughton, to whose memory I am proud to pay this last tribute.

(*B*) THE PORCUPINE OF ASSAM.

Among the Natural History Specimens obtained in Assam by Mr. J. P. Mills and presented by him to the Society there is a perfect and fully adult skull of a Porcupine, and I have been asked to determine its species.

It is of medium size, and certainly does not belong on the one hand to a large Crested Porcupine, such as the ordinary *Acanthion leucurus*, nor on the other to the small crestless porcupine, *A. hodgsoni*. It would however appear to be related to the intermediate group of which *A. brachyurus* is the oldest known member, a group to which also *A. klossi* and *subcristatus* belong. This group ranges from China through Siam to the Malay Peninsula, but has not hitherto been found in Assam.

The skull obtained by Mr. Mills would appear to represent a new species, which may be called—

Acanthion millsi, sp. n.

Size rather less than in *A. klossi*. General character of the skull more rounded and inflated than in *klossi*, almost as much as in *subcristatus*, the upper outline strongly bowed. Region across forehead considerably swollen, so that the outer bar of the anteorbital foramen is scarcely visible from above, while it is broadly visible in *klossi* ; posterior part of interorbital region scarcely narrower than anterior. Nasals large, convex, much expanded behind, shorter but broader than those of *klossi*, and reaching well behind the lacrymal bones. Frontal suture comparatively long, just on half the length of the nasal suture, therefore longer proportionally than in the other species. Parietal region of skull rather short, not longer than the frontals, and with comparatively little occipital projection. Outer outline of zygomata more expanded at the level of the anteorbital bar, the two zygomata behind this bar more nearly parallel than in the allied species. Mesopterygoid opening broad.

Dimensions :—Upper length 131 mm. ; condylo-incisive length 126 mm. ; zygomatic breadth 69 mm. ; nasals, length 69 mm., anterior breadth 25·5mm., posterior breadth 39 mm.; breadth between outer corners of the anteorbital foramina 59 mm. ; interorbital breadth anteriorly 51 mm., posteriorly 49 mm. ; median length of frontals 33 mm., of parietals 32 mm. ; palatilar length 62 mm. ; breadth of mesopterygoid fossa 17 mm. ; upper cheek-tooth series (crowns) 29.

Hab.—Naga Hills, Assam ; type from Sangrachu, 3,500′.

Type.—Adult skull, female. B. M. No. 21. 7. 16. 4. Collected by Mr. J. P. Mills. Presented by the Bombay Natural History Society, "Brought in by Nagas"—J. P. M.

This porcupine may be distinguished from its only near relative *A. klossi* by the more swollen character of the face, the large broad nasals, parallel-sided interorbital space, and subequal frontals and parietals.

Anderson's *Hystrix yunnanensis* is a species with quite small nasals, allied to *javanicus*, and Blyth's *bengalensis* is certainly the same as *hodgsoni*, as I have been able to prove by some measurements of the skull of its type kindly sent me by Mr. Stanley Kemp of the Indian Museum.

Mr. Mills is to be congratulated on his discovery of this fine addition to the Assam fauna.

(*C*) A NEW FERRET BADGER (*HELICTIS*) FROM THE NAGA HILLS.

Among the specimens from the Naga Hills, presented by Mr. J. P. Mills to the Bombay Natural History Society, are four specimens of a Ferret-Badger (*Helictis*). It proves to belong to the small-toothed group of these animals, the true *Helictis*, not hitherto known to occur within the bounds of British India, those previously known being members of the other group, that of the large-toothed forms. In my opinion however these latter should be considered as of a different genus, for which the name *Melogale* is available.

Up to the present, the true small-toothed *Helictis* has been only known from China, so that its occurrence in the Naga Hills is of much interest. And even in China its range is rather to the East and South, than in the region approximating to the Naga Hills.

The species is clearly new, and may be described as follows :—

Helictis millsi, sp. n.

Size about as in *H. moschata*. Fur shorter than in that animal, in summer pelage only about 10 mm. long on the back, and almost without underfur, in winter pelage about 20 mm., with a fair development of under fur, but far less than in the *Helictis* of the lower Yang-tse. General colour "dark purplish grey" very different from the drabby brown, or dark wood brown, of the Chinese animal. Ground colour of top of head from muzzle down nape to withers, much darker, near blackish brown. White markings present, well defined, the white patches about of the same size as in examples of *moschata* from the lower Yang-tse, larger than in the typical specimens from Canton, median white line interrupted on nape, and ending on withers. Under surface dull whitish as usual, the sides of the belly grey. Ears grey with white edges. Hands and feet grey, the digits sometimes whitened. Tail blackish grey washed with whitish, the white not specially developed.

Skull apparently very like that of *H. moschata*, except that the anteorbital foramina are lower and more transversely extended. Teeth quite as in *mosehata*.

Dimensions of the type, measured on skin :—

Head and body 365 mm. ; tail 163 mm.

Skull, greatest median length 79.6 mm. ; zygomatic breadth 46 mm.; interorbital, breadth 20 mm. ; mastoid breadth 36.2 mm. ; anteorbital foramen 5.6×3.5 mm. ; palatal length 38 mm. Front of canine to back of m^1 24.7 ; length of p^4 on outer edge 6·4 mm.

Hab.—Naga Hills, Assam. Type from Mokokchung, 5,000′.

Type.—Adult male in summer pelage. B. M. No. 20.6.6.8. Original number 10. Collected 10th Ootober 1919 and presented by J. P. Mills, Esq., to the Bombay Natural History Society, and by them presented in turn to the National Museum. Four specimens examined.

This fine species is at once distinguishable from the Chinese species by its general colour, dark grey instead of drabby brown.

NOTE ON THE NOMENCLATURE OF THE NORTHERN *SLOW LORIS*

By

Oldfield Thomas, F. R. S.

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In connection with the examination of a fine specimen of *Nycticebus*, obtained in the Naga Hills by Mr. T. H. Hutton and presented to the National Museum by the Bombay Natural History Society, the following nomenclatural points have arisen.

In writing on this group, certain American authors* have used the specific name *coucang* for the form found in Bengal and Assam, this name being based on Boddaert's *Tardigradus coucang*, which in turn was a technical name applied to Pennant's "Tailless Maucauco."

In the third edition of his Quadrupeds, Pennant gave two different figures of the "Tailless Maucauco" the second of which (obviously a copy of Vosmaer's plate) corresponds with the Assam and Bengal species, while the first is clearly one of the Malay or Island forms, with strong facial markings, including a bifurcated dark line on the crown.

But neither Stone and Rehn, nor Lyon have noticed that, in the first edition of Pennant, which is alone quoted by Boddaert, the latter animal, the form with a bifurcated line, is the only one figured and described, so that it must be the basis of the specific name *coucang*, which should therefore go to one of the Malayan species with this character. It is true that a mention of Bengal is made as locality, but this has evidently come in from some other source, and does not affect the fact that the description and figure apply to the Malayan, and not to the Northern form. To which Malayan species the name *coucang* should go is not at present clear, and perhaps may never be certainly determinable.

But for the Northern form, Geoffroy's name *bengalensis* now becomes available, and will stand for the animal found in Assam, and perhaps in Bengal proper.

The beautiful specimen of *Nycticebus bengalensis* obtained by Mr. Hutton, the first we have received, agrees remarkably well with Vosmaer's characteristic figures of 1770, and should undoubtedly be determined as the *bengalensis* of Geoffroy, based on that figure, unless a definitely different form is hereafter found in Bengal itself.

Mr. Hutton gives the following interesting account of the animal :—

> "It was caught in a snare in this district by a Kuki last week. The animal is decidedly rare in this neighbourhood, and is seldom taken, the man who brought it to me having not seen one before and declaring that it must be an immature hoolock. The Kukis have, however, a name (*Mittungkoi*) for the animal and regard it with awe as being the priest of the hoolock. Had the captor known what it was, he would have let it go. It is said to have exceptional vitality, and the one of which the skin is now sent, certainly proved to have, as when brought to me it had been injured internally, as it afterwards appeared, and had one wrist broken and had not had food probably for some days. Nevertheless it survived the amputation of the injured limb under chloroform, and lived for three days, taking only a little milk, and when it became obvious that there was some internal injury, and it was decided that it would be kinder to kill it, this was not done with the ease which one would expect in the case of so small an animal. The Angami and Sema Nagas to whom I showed the animal had never seen one and said they had no name for such. I am sending it to you as I very much doubt whether you have received a specimen from Mr. Mills, from this district."

* Stone and Rehn, P. Ac. Sci. Philad. LIV., p. 137, 1920; Loyn, P. U. S. Nat. Mus., XXXI., p. 532, 1906.

A DAY'S SHOOTING ON THE NILGIRIS NEAR OOTACAMUND.

BY

Lt.-Col. H. R. Baker, I.A. (retd.)

(*With two plates.*)

"Good morning, Sir."

I look up with a start from my work in the garden to find Anthony, my shikari, with a broad grin on his face enjoying the "jump" he had given me. He always likes to steal up quietly and take me unawares, does Anthony; I suppose he considers it is "infra dig" for a shikari to make a sound. 'What is it"? I ask, though I know very well what he has come for, because I generally go out shooting once a week during the season and invariably send him out a day or two beforehand to prospect for game and he has come to report; I find it best to do this because if one goes out without prospecting one is liable to go to a place where some one else has recently been.

"Done see two woodcock, Sir; master better come at once.'

But I object to come at once as arrangements have to be made to hire a carriage (I don't possess a car !), to get the tiffin basket ready and to collect and send out the beaters; so I enquire where it was he saw the cock.

"Near Forester Hut, Sir; one in shola near first swamp, one in long nala where master missed jungle cock last time."

I don't like being reminded of such things so hasten to arrange to go out the next day, meeting the beaters at Forester's Hut at 8 a.m., meanwhile I send to arrange for a carriage to be at the bungalow at 7 a.m. next morning, warn the cook to have curry-puffs and other good things made over night and packed into the tiffin basket, not forgetting liquid refreshments and smokes and a change of boots and socks, and I am ready barring the filling of the cartridge bag and the putting together of the gun.

Up early next morning I proceed to awaken my son C. who had overnight informed me that "he did not mind coming." He is up here only for a short visit and it is not worth his while taking out a game license which costs Rs. 30 for a month or Rs. 50 for the whole season; however he is keen enough when once he gets out and it is a good education for him. A substantial chota hazri follows and we are soon dressed in our shikar kit which consists of the oldest garments we possess because we have occasionally to scramble through thick jungle, to say nothing of having to wade through treacherous, boggy swamps—and we are ready for the gharry and what a conveyance it is when it does turn up, late of course as usual ! a wretched old victoria that once boasted of rubber tyres and a pair of skinny worn-out horses that are really past work. Ooty does not boast of a decent livery-stable and one has to take what comes or foot it, or stay at home; and to make matters worse bad luck seems to come my way pretty often. On two occasions one of the horses slipped down on the asphalt portion of the road soon after starting necessitating a wait till a fresh (?) horse has been procured and on another occasion one of the wretched ill-fed beasts got colic when we had gone some 6 miles on our way obliging us to stop and unharness it, when it promptly lay down and remained where it was till evening when it was taken to its stable and died during the night ! however, we happened that time to be not so very far from the rendezvous so we set off to it on foot and by evening another horse had been fetched. "Nil desperandum"! so we load up to-day hoping we won't have any accidents and off we go as fast as the skeletons of horses can draw us and what a glorious sensation it is to drive, even at a crawl, in the early hours of a December morning up in these hills ! hoar-frost lies in all the hollows and there is a keen nip in the air in spite of the sun which rises

COUNTRY ROUND OOTACAMUND.

pretty early, and what lovely views we get over the Downs and away to the "Kundahs" as we drive along to our destination!

Shortly after starting we pick up Anthony who is waiting at the cross-roads near his hut; it gives him a certain amount of prestige to be seen by the beaters driving out with the Sahibs instead of walking it with them; and in about an hour, the gods having been kind to us and no accident having occurred, we arrive at the Forester's Hut. But we are not "there" yet; and now we are faced with a very steep though short bit of hill, up which the horses stolidly decline to drag the gharry so long as we are in it; so there is nothing to do but get out and all shove behind! eventually after much free advice from everyone to every one else and much urging on the horses we manage to get the gharry to the top of the incline and then we have only a short mile further to go before reaching a spot where the road ends and numerous paths begin. Here we are met by the beaters, a miscellaneous crew of old men and boys and of course the shikari's dog, a beast called Rover which acts up to its name, ever racing madly through the sholas and over the hills if not led on a string. No use warning Anthony not to bring the beastly dog; he apparently thinks the party is incomplete without it and even if he keeps it hidden in the back ground at the start it is sure to turn up before we have gone very far.

Leaving the gharry there against our return at about 4-30 p.m., I take the gun and put a few cartridges in my pockets, C. takes nothing but cigarettes and a stick! and the shikari carries the cartridge-bag and snipe-stick and we start down one of the paths followed by the beaters and the chokra carrying the tiffin-basket. Presently we see ahead a small "shola" (patch of jungle) and, while C. and I take up our position on one side of it, Anthony goes round the corner to spot any game that may break out from that side and the beaters climb the hill ready on the shikari's whistle to advance through the shola towards me, yelling and beating the trees and bushes as they come. No luck here and the first beat of the day draws a blank so we move on to another shola, a bigger one about half a mile away. Through this a sluggish stream runs with muddy pools at its exit such as "cock" love; this is where Anthony says he saw one a few days ago so I send him to reconnoitre while we others sit down for a bit. We can see him gingerly approach the stream, carefully thrusting the bushes aside so as to make no sound and peering down at the muddy parts to try and find the tell-tale signs of the "cock" having been on the feed there—holes drilled here and there by its bill when searching for worms, &c., and the imprint of its toes in the mud, for it must be remembered that "cock" do not necessarily stay long in one place, they move about according to the food supply and it does not mean that because one was seen at a certain spot yesterday it will be there to-day.

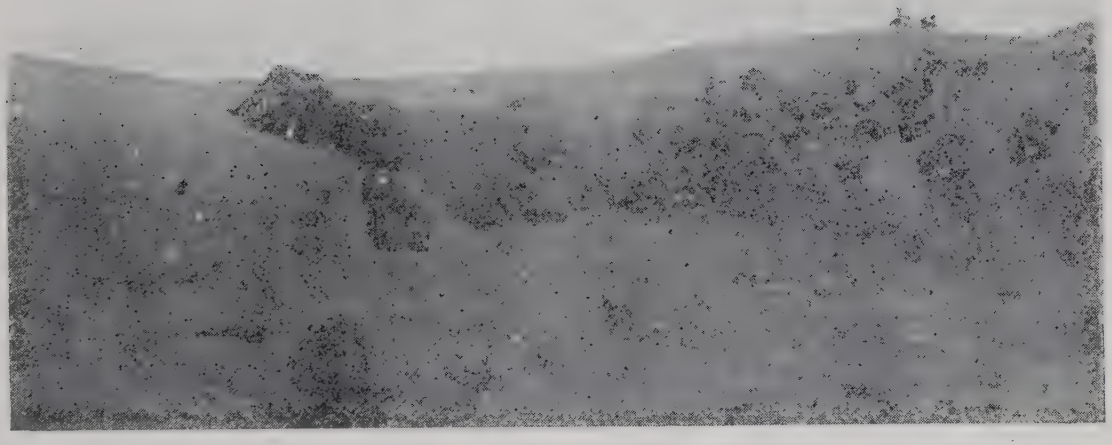
We have not long to wait however before Anthony makes a sign for me to come along, which means that he has found what he was looking for, and he shows me where he wants me to stand, at a spot from which I can command both sides of the stream in case the "cock" emerges on this side or that.

The beaters meanwhile know what they have been taught by me to do on such occasions—they range themselves in a line at right angles to the edge of the shola and to a depth inside it of some 30 yards and when all is ready and they have heard the shikari's signal they move forward quietly, making no more noise than tapping the bushes now and then. This is quite enough to flush the "cock" if there is one and according to my experience one is much more likely to get a shot at it than if the beaters make the usual row they do when beating for jungle-fowl—too much noise scares the "cock" and it is then liable to run on ahead and to break away out of range.

This time all turns out well and just before the line of beaters reaches the stream one of the men calls out "Woodcock" and out it comes in no great hurry and flies along the edge of the shola evidently looking for another opening amongst the bushes in which to drop to cover again, but the shot is too easy to miss and

the "cock" is duly bagged. The beaters are now sent uphill to the top of that same shola and they beat it as usual for what it may contain in the way of jungle-fowl or other game, while I take up my stand on the opposite slope. Nothing at first is seen or heard except a miscellaneous crowd of jungle birds that always flee before the beaters; commonest among them is the "South Indian black Bulbul" (*Hypsipetes ganeesa*) a noisy bird that associates in small flocks keeping to the tops of the trees and continually uttering a harsh "cheeping" sort of cry; then come "Grey-headed Flycatchers" (*Culicicapa ceylonensis*), "Small Green Barbets" (*Thereiceryx viridis*), "Nilgiri Blackbirds" (*Merula simillima*), "Southern Red-whiskered Bulbuls" (*Otocompsa fuscicaudata*), "White-eyed Tits" (*Zosterops palpebrosa*) and a host of others all in a mighty hurry to get away from the noise behind, while overhead is a party of "Jungle-Crows" (*Corvus macrhorhynchus*) which now circle round uttering their harsh warning caws, now congregate on the topmost branches of the tallest trees calling down curses on the human beings below. How one longs to fire a shot into the "brown" or rather "black" of these beastly crows to scatter them, but of what use would it be? they would come back again before long making more of a fuss than ever. Now a cry of "koli koli" is raised by the beaters indicating that they have seen or heard jungle-fowl, and "look-out, Sir" as a cock and hen fly out of a dense tree; but again no luck, these "koli" are deuced cute, and they turn back over the beaters and fly back to the farthest extremity of the shola; still the beaters come on and at last a pigeon, "the Nilgiri Wood-pigeon" (*Alsocomus elphinstoni*) steals out quietly, sees me standing there and wheels back, but not fast enough, I catch him as he offers a "broadside" on. Little use beating that shola over again as it is too large and the jungle-fowl if moved again, which is unlikely, would ten to one not face the open, so we carry on to the swamp near by spoken of yesterday by the shikari, in the hope of picking up a "ishnap" or two. Oh! these Nilgiri swamps! they are responsible for a lot of bad language! the going is not like that in a paddy-field where although one may sink in pretty deep one knows what to expect and it is more or less plain sailing, allowing one to keep one's eyes on the ground ahead; these swamps are a mass of traps for the unwary; it looks all right, not much water and plenty of long grass but this grass hides many a deep crack and crevice into which one stumbles almost at every yard; a step or two on fairly firm soil then in you go up to your thighs in slimy black mud just at the moment when a snipe elects to get up! and there is no looking ahead, one has to watch and pick each step and trust to luck to be in time to look up and see a snipe if it rises. So we line out; C. wisely keeps to the bank but I have to go into the middle as the swamp is too broad for me to command the whole of it from one bank, and the fun begins; first one beater, then another takes a header into the grass and gets up covered with mud while I walk like a cat on hot bricks holding my gun muzzle up over my shoulder as the safest place for it while my left arm swings wildly like a semaphore as I try to keep my balance and also to save myself from going too far in when I do get a spill. No wonder only a couple of snipe is bagged under such conditions but then there is this also to be said—it is getting on in the season and I notice that although snipe are found in fair numbers (for Ooty) at the beginning of the season in the open swamps such as this one (my best bag this last season was 8½ couple obtained early in November), later on they desert such places and are found much like woodcock under the bushes at the edge of the sholas which fringe some of the swamps.

At last we are out of the swamp, hot and dirty and with our tempers considerably ruffled and in front of us is a steep and high hill over which we have to pass to get to the long nala where Anthony says I—but never mind! such things will happen and it is just as well or the game would soon be shot out. Up we climb, and Lord! how we pump and blow; it is wonderful how hot one gets



A WOODED NALA LEADING DOWN TO MARSHY GROUND.
A LIKELY SPOT FOR WOODCOCK.

A FINE JUNGLE FOWL SHOLA NEAR OOTACAMUND, NILGIRIS.

trudging up these hills, and in the winter too ; and reaching the top we see below us a large shola ending off in a long, narrow, wooded nala between two close hills.

The shola does not look a likely place for cock so we beat it in the ordinary way; and that beast of a shikari's dog gets loose and races through the shola ; presently it begins to yap and out darts a hare far out of range with the dog after it so we leave them and go on with the beating and are lucky enough to put out a jungle cock and hen (*Gallus sonnerati*) and I bag the cock but the hen slips by before I can turn round to get a shot at her. At what a pace these birds do fly when once they have got up steam ! from the look of them one would imagine them to be clumsy fliers, but far from it, one misses a great many more than one brings down through not aiming far enough forward. Then we come to the nala and the beaters are halted to enable me to get to an opening some hundreds of yards further down. C. and the shikari divide the distance between me and the beaters to spot if any cock tries to sneak out and back, and when I am ready the beaters advance slowly and quietly till they come to me when they wait for me to go on ahead again.

The first advance draws a blank but in the second one C. spots a "cock" creeping along the bottom of the nala and gives me the tip that it is coming my way ; on they come and before long flush the "cock" which comes towards me twisting and twirling among the trees ; I dare **not** fire towards the beaters in case of hitting one and have to let the "cock" go past me and give him distance and just as he turns into another opening I catch him and bring him down. From the quantity of feathers that fly out we all think it is a deader but on going up to the spot where it fell not a sign of the bird is to be seen and there is nothing for it but to cut down the bracken and bushes all round and search—and search we do for a good half hour and eventually the shikari who has scouted down the nala finds the woodcock a good hundred yards away hidden under a bush ; it is wonderful how these birds will run sometimes, wounded or not.

Just at the end of the nala where it opens out into a small swamp, the beaters put up another hare on the opposite slope to the one I am on and a fluky snap-shot bowls it over. It is now about midday and time for tiffin so C. and I seek a shady tree, yell for the basket-walla and set to with a relish while the men stray away to the stream and eat their food which each has been carrying tied up in a rag round his middle.

After tiffin we pack up the remains and squeeze in the game and padlock the basket (a most necessary precaution) before sending it back to the gharry where the food and drink will come in well for tea when our day's sport is finished. An hour's halt and a pipe and it is time to be moving on if we are to complete the round as mapped out by Anthony.

The beating during the afternoon is just the same as during the morning except that most game birds, as well as animals, will be found resting and sleeping till it is again feeding time and as the birds sit up in the densest parts of the trees where they are invisible from the ground it is very difficult to dislodge them and so one does not often get a shot, except at snipe, till 3-30 or so. But ground game of course is disturbed easily throughout the day and one often hears a crashing and thudding of feet in the sholas followed by the appearance of sambhar hinds and young, or may be a muntjac (barking deer or jungle sheep) will slip out quietly in front of the beaters and make for the nearest cover ; one could often shoot these little animals with large shot from a shot gun, but one is obliged by the rules of the game association to use ball for them.

Not long ago when walking down a path through a very large shola near this self-same Forester's Hut we saw distinct pug-marks of two tigers, apparently a female and cub ; these we followed for a couple of hundred yards or so to where the beasts had turned off the path into the jungle and as we had no rifle we went on; a few days later when my shikari was again in that neighbourhood he saw

the tigress and cub, and the next we heard of them was that a Badaga had shot the tigress with his old blunderbus and had brought the carcase in to the collector's office for the reward.

But to resume, we beat several sholas and swamps on our way back and add another hare, a woodcock, two jungle fowls and four snipes to the bag. So ended what was to us a perfect day with a bag a good deal above the average.

Folks on the plains, accustomed to large bags of snipe, ducks, partridges, pigeons and so on may jeer at such a bag but to counterbalance the smallness of it one must take into consideration the delightful climate, glorious views and A1 exercise—personally I would any day prefer a day's shooting up here to the best obtainable down on the plains.

It may be of interest to sportsmen if I give my bag obtained here this last season 1920-21 ; it will show more or less what may be expected in the way of small game :—

Woodcock	.. ..	$18\frac{1}{2}$ Couple.
Jungle fowl	.. ..	19 „
Snipe	.. ..	$72\frac{1}{2}$ „
Spur fowl	.. ..	$2\frac{1}{2}$ „
Pigeons	.. ..	$19\frac{1}{2}$ „
Hares	.. ..	$6\frac{1}{2}$ „

or a total of 277 heads for 33 outings, giving an average of between 8 and 9 per day.

N.B.—For further information concerning the shooting obtainable on the Nilgiris, sportsmen are advised to read "Small-game shooting around Ootacamund" by Rolling Stone (Lt.-Col. H. R. Baker) obtainable at the Ootacamund and Nilgiri Press, Ootacamund, South India, price 8 annas, postage half-anna.

Eds.]

NOTES ON BATRACHIA.

By

C. R. Narayan Rao, M.A.

(*With a text block.*)

The delay in publishing the following notes, dealing with a part of my collection of batrachians made in 1918, is due to the fact that Dr. Boulenger's manual, Fauna of British India, Reptilia and Batrachia, was found inadequate for the purpose of accurately determining the species. The publication of his recent memoir on the genus *Rana* has rendered the situation, at least a part of it, comparatively easy. In order to make the ground surer, my specimens were sent to the British Museum to be compared with the large series of collections at that institution, where they were kindly examined by Miss J. B. Procter to whom my grateful thanks are due. I quote freely from her letter regarding every specimen subjected to her examination and I have given full reasons for differing from her in cases where I have done so.

Rana gracilis montanus var. nov. (sub-genus *Hylorana*.)

Vomerine teeth in short, oblique series between the choanae, farther from each other than from the latter.*

Head well depressed, longer than broad ; the upper surface of the head slightly concave with a prominent U-shaped glandular fold ; the two limbs of the fold run close to the upper eyelid, and diverge in front of the eye. The broad angle of the fold extends as far back as the end of the head.* Snout obtusely, projecting beyond the mouth : the length of the snout is distinctly greater than the diameter of the eye. Canthus rostralis distinct; loreal region vertical, slightly concave. Nostrils nearer the tip of the snout than the eye. The interorbital width is considerably broader than the upper eyelid ;* the distance between the nostrils is shorter than the interorbital space.* Tympanum very distinct, $\frac{3}{5}$ to $\frac{5}{8}$ the diameter of the eye, separated from it by a space equal to a third or exceeding a third of its diameter.*

Anterior limb.—Fingers slender, swollen at the tips, first finger longer than the second ; the third considerably longer than the snout or $1\frac{1}{2}$ to twice the diameter of the eye. Subarticular tubercles large and prominent.

Hind limb.—Long and slender, the tibio-tarsal articulation reaches far beyond the snout :* heels strongly overlap when the limbs are folded at right angles to the body. Tibia 4·5 to slightly 6 times as long as broad ;* $1\frac{1}{2}$ to $1\frac{3}{4}$ times in the length from snout to vent ;* shorter than the forelimb ; much longer than the foot.* Toes long and slender ; tips dilated into small discs. longer than broad with a horse shoe-shaped groove separating the upper surface from the lower. Half-webbed, three phalanges of the fourth, one of third and fifth toes free. Outer metatarsals separated by a web. Subarticular tubercles as big as those of fingers and prominent. No tarsal fold. Inner metatarsal tubercle blunt prominent, suboval $\frac{1}{3}$ to $\frac{1}{4}$th the length of the inner toe. A rounded outer-metatarsal tubercle on the base of the fourth toe.

Skin smooth above. A moderate dorso-lateral fold from above the tympanum to the groin. The greatest distance between the dorso-lateral folds on the back is $\frac{1}{4}$th the length of head and body.* A second or ventro-lateral fold is absent. A short fold, rather interrupted behind, from the end of the snout or beneath the eye to the shoulder. A few glandules simulating a fold on the shoulder.

Colour.—Olive-brown above : sides of head and body dark-brown. Dark spots frequently present on the back in younger specimens. The dorso-lateral glandular fold pale-brown or whitish, edged with a dark streak to the tip of the snout. Tympanum reddish. Upper lip white. Dark broad bands on both

limbs. Hinder sides of thighs marbled, and the ventral surface yellow. Throat mottled. In the young, the subocular fold is white and the foot black.

Bones.—Nasal bones very broad, separated in the middle. Behind, the nasals unite with the fronto-parietals. The suture between the frontals and the parietals noticeable. The ethmoids exposed ; fronto-parietals and ethmoids form the U-shaped ridge which lies below the fold of skin on the head. The zygomatic branch of the squamosal equals its posterior branch. The diapophyses of the sacral vertebra are elevated dorsally. The omoosternal style is broadly forked. Metasternum very long.

Locality.—1 and 2 Hill forests of Bhagamandla and 3, 4 and 5 Hills, Somavarpet, Coorg, 4,000—4,500 feet. They were all taken near the water courses. My colleague Mr. A. Subba Rao recently obtained several specimens of this local race from the hills of Kadur, Mysore, 4,000 feet.

Miss Procter who examined only a single specimen says, "your specimen of *Rana gracilis* agrees well with ones from Ceylon in this collection." An expression of opinion like this lead me to scrutinise my examples more thoroughly and the conclusion I have arrived at is that they belong to a new local race of *gracilis.*

Points marked* in the above description are the characters in which all my five examples differ from the Ceylon specimens and in order to render the position still more clear I give below the measurements of Dr. Boulenger side by side with my own.

Nos. 1 (type) and 2 have been sent to the British Museum and 3 and 4 to the Indian Museum.

Measurements in mms.	Rana Gracilis. Dr. Boulenger's measurements of his five Specimens.					New Variety. Central College Specimens.				
	1	2	3	4	5	1	2	3	4	5
Snout to vent	50	64	60	47	41	75·6	65·5	63	33	41
Length of head ..	18	22	19	16	15	26	24·5	25	13	15
Width of head ..	16	19	19	15	14	25	22·5	23	11	14
Snout	7	9	7	6	6	11	12·5	11	6	7
Internasal width ..	..	..	..	..	..	7	7	7	4	5
Interorbital width ..	4	5	4	4	3	8	7·5	8	3·5	5
Distance between nostril and eye	..	..	..	..	..	6	6	6	4	4·5
Diameter of eye ..	6	7	6	6	6	10	8·5	8·5	5	6
,, of tympanum	5	5	5	4	4	6	5·5	5	3	3·5

Measurements in mms.	Rana Gracilis. Dr. Boulenger's measurements of his five Specimens.					New Variety. Central College Specimens.				
	1	2	3	4	5	1	2	3	4	5
Distance between eye and tympanum ..	..	..	..	..	..	2·5	2·5	2·5	1	2
Anterior limb	33	40	40	32	27	54	42	46	25	34
„ 1st finger ..	8	10	10	7	6	13	10·5	11	5	7
„ 2nd „ ..	6.5	8	8	6	5	10	8	9	4	5
„ 3rd „ ..	10	12	12	9	8	15	12	12	7	10
„ 4th „ ..	6	7	8	6	5	9	8	8	4.5	6
Hind limb	90	105	109	91	73	143	121·5	126	57	85
Femur	..	..	..	..	..	34	30	30	14	22·5
Tibia	28	34	34	28	24	44	39	41	19	26
Tarso metatarsus ..	..	..	..	..	..	21	18·5	23	9	13
Foot	29	34	35	29	25	37	34	32	15	27
1st toe	..	..	..	..	..	13	7	8	5	5
2nd toe	..	..	..	..	..	18	13	14	7	8·5
3rd toe	15	18	19	15	13	27	18·5	21	9	14·5
4th toe	24	29	29	24	21	38	30	33	14	22
5th toe	16	22	21	16	14	28	20	21	10	15
Outer metatarsal tubercle	..	..	..	..	..	2	2	2	1	1
Inner metatarsal tubercle	..	..	..	..	..	3	2·5	3	1·5	2

Rana bhagmandlensis sp. nov. (sub-genus *Hylorana*.)

Vomerine teeth in oblique series from the anterior angle of choanæ, extending beyond the level of their posterior borders, being separated by a narrow median line only. The tongue is deeply indented and the coruna are fairly long.

Habit.—Body slender with a waist.

Head moderate, depressed, the length is to breadth as 6 is to 5 : snout subacuminate, not projecting beyond the mouth. The snout is nearly as long as or only very slightly longer than the diameter of the eye. Canthus rostralis distinct, gently sloping towards the tip of the snout : loreal region vertical and concave. The interorbital width is equal to the internasal distance and is nearly twice the width of the upper eyelid : nostrils nearer to the tip of the snout. Tympanum very distinct half or slightly more than half the diameter of the eye. The distance between the eye and the tympanum is less than half the diameter of the latter.

Anterior limbs.—Fingers long and slender, the first equals the second : tips of fingers dilated into discs bearing a horse-shoe-shaped groove, separating the upper surface from the lower. Subarticular tubercles prominent. No tubercular swellings on the palm.

Hind limbs.—Long and slender ; the tibiotarsal articulation reaches between the eye and nostril : the heels overlap when the limbs are folded at right angles to the body : tibia nearly four times as long as broad, more than half the length of the body (from snout to vent), and considerably shorter than the foot : tips of toes discoidal and half-webbed : no dermal borders on the first and last toes : the third toe is just as long as or only slightly shorter than the fifth. Two metatarsal tubercles, both papilla-like, the white outer is at the base of the fourth toe ; the inner nearly twice as long as the outer and less than $\frac{1}{4}$ the length of the first toe. Subarticular tubercles well developed though small.

Skin.—Upper surface smooth, extremely fine pearly granulations. A frontal gland is present. The dorso-lateral glandular fold is moderate : ventral surface is smooth : no glandular fold from the eye to the shoulder. A few glandules simulating a fold on the shoulder and behind the angle of jaws.

Colour.—Upper surface bright orange in the adult spirit specimens and pink in the live condition : more greyish with mottlings in the younger forms. Sides of body and snout dark. Ventral surface yellow, becoming orange on the lower surface the thighs : abdomen faintly blotched. Both limbs barred. Foot black, the jaws are white, throwing the loreal region into strong relief.

Skull.—Nasal bones are broad and unite with one another and with the fronto-parietals ; Omoosternal style forked at base and extending anteriorly nearly as far as the corpus linguæ ; metasternum also long ; epi and pre-coracoids almost disappear.

Locality.—Water courses in the forests of Bhagamandla, Coorg, 4,000 feet.

According to Dr. Boulenger's scheme this frog would be put in section D, *R. erythræa.*

Miss Procter who examined two specimens writes thus : " Possibly a new species. They agree well with the description of *R. aurantiaca* in Dr. Boulenger's monograph, but they are not the same. I have compared them with a specimen and find that though they have similar characters and colouration, *R. aurantiaca* is much more elongate in habit, length of head going $3\frac{1}{4}$ in total length as against $2\frac{1}{2}$."

No. 1 (type) presented to the British and No. 2 to the Indian Museum.

Measurements of *Rana bhagmandlensis* in mm.

——	1	2	3
From tip of snout to vent	30	23·5	16
Length of the head	12	10	6·5

	1	2	3
Greatest width of the head	10	9	5
Snout	6	5	3
Internasal width	3	3	2
Interorbital width	3	3	2
Distance between the eye and nostril	4	3	2
Diameter of the eye	5	5	2
„ „ tympanum	3	2·5	1·5
Distance between the eye and tympanum ..	1	1	·5
Anterior limb (including the digit)	18	17	10
1st finger	4	2·5	2
2nd „	4	2·5	2
3rd „	6	5	3
4th „	4	3	2
Hind limb	57	40·5	22·5
Femur	11	10	6
Tibia	16	13	8
Tarso metatarsus	9	6·5	8·5
Foot	21	11	10·
1st toe	4	3	..
2nd „	6	3·5	..
3rd „	10	5	..
4th „	14	9	..
5th „	3	5	..
Breadth of tibia	4	3	..
Metatarsal tubercle	1	1	..

RANA LIMNOCHARIS MYSORENSIS var. nov. (sub-genus *Rana*).

Vomerine teeth in oblique series between the choanæ, beginning about the middle of these orifices, meeting in the median line and not extending beyond their posterior borders.

Habit.—Body slender with not a well-marked waist.

Head as long as broad, moderately depressed : snout pointed, slightly projecting beyond the mouth, longer than the diameter of the eye. Canthus rostralis obtuse : loreal region oblique and slightly concave. Nostrils nearer the tip of the snout. Internasal width equals the interorbital space which is much less than the upper eyelid. Tympanum distinct, $\frac{1}{2}$ to $\frac{3}{8}$ the diameter of the eye and nearly twice its distance from the latter.

Fore limbs.—Fingers blunt, long and slender ; first longer than the second; third as long as or a little longer than the snout. Subarticular tubercles well developed and very prominent ; the base of the second and third fingers usually swollen into round tubercular prominences.

Hind limb long, the tibio-tarsal articulation reaching nearly the tip of the snout : heels very broadly overlap when the limbs are folded at right angles to the body. Tibia about four times as long as broad ; $1\frac{1}{2}$ to $1\frac{3}{4}$ in length from snout to vent : about $\frac{2}{3}$ the length of the foot. Toes slightly swollen at the tips, less than half-webbed, two segments of the fifth, three of the fourth and two of the others are free. Outer metatarsals nearly free. Subarticular tubercles shovel-shaped or discoidal and very prominent. Tarsal fold well developed in the distant half. Inner metatarsal tubercle about $\frac{1}{3}$ or less than $\frac{1}{3}$ the length of the inner toe. A fairly big rounded outer metatarsal tubercle not confluent with the dermal fold of the outer toe.

Skin.—Upper parts with longitudinal cutaneous folds from behind the head right up to the end of the body, with shorter broken folds between. Sides with warty tubercles, sometimes tipped with cornified minute spines. No fold across the head behind the eyes. A strong curved glandular fold from the eye to the shoulder. Abdomen corrugated. Throat and chest smooth. Thighs free from granules.

Colour.—Olive-brown or green above with a distinct narrow or broad yellow vertebral band: the upper surface is blotched ; a V-shaped dark band between the eyes ; dark bands radiate from the eyes and a white streak from the posterior border of the eye to the shoulder passing through the lower half of the tympanum. The abdomen is yellow. Throat and chest beautifully marbled or powdered black. Lips blotched or the lower lip with a series of white vertical bands separated by very dark areas, sometimes producing a festoon-like arrangement. Limbs barred. Hinder surface of thighs marbled.

Locality,—Water courses in the forests of Jog, Shimoga, Mysore State, 4,000—5,000 feet.

This local race is to be assigned to the group *Rana tigrina*.

Miss Procter who examined a specimen of this frog writes as follows ; " It does not disagree in any particular with *R. limnocharis*. There is, however, certainly something about its *tout-en-semble* which differs from the majority of our specimens. Several specimens here have equally short webs and several have the broad vertebral band associated with longitudinal glandular folds. instead of the commoner warts. A male and a female from Sikkim have similar, but less strongly marked ventral corrugations. Possibly yours is a local race."

This local race of which I have several examples though unfortunately most are under 31mm. differs from *R. limnocharis* forma typica and its known varieties in having a smaller tympanum in relation to the diameter of the eye, in the proportions of the length and breadth of the tibia, and the ratio of the former to the total length of body and being shorter than the foot. The absence of any fold behind the head and non-granulate thighs add to the distinctive character.

No. 1 (type) and a few more examples presented to the British and No. 2 to the Indian Museums.

Measurements in mm. of *Rana limnocharis mysorensis.*

Those below 31mm. have not been measured, but have been examined otherwise.

	Sgn. type 2. mm.	Type No. 1, mm.
From tip of snout to vent	31	36·5
Length of the head	10	13
Width of the head	10·5	14
Snout	5	6·5
Internasal width	2.5	2
Interorbital width	2·5	2
Distance between the nostril and eye	3	3
Diameter of the eye	4·5	5
„ „ tympanum	2	3
Distance between tympanum and the eye	1·5	1·5
Anterior limb	21	24
1st finger	4·5	7·5
2nd „	3	6
3rd „	5	7
4th „	3·5	6
Hind limb..	57	79
Femur	13·5	18
Tibia	17	24·5
Tarso metatarsus	9·5	11·5
Foot	17	25
1st toe	3	7
2nd „	5	10
3rd „	9·5	16

	Sgn. type 2. mm.	Type No. I, mm.
4th toe	16	23
5th „	11	16
Metatarsal tubercles .. .. .. inner	1·5	2
Metatarsal tubercles .. .. .. outer	1	1
Width of Tibia	4·5	6

THE TADPOLES OF NYCTIBATRACHUS SANCTI-PALUSTRIS.

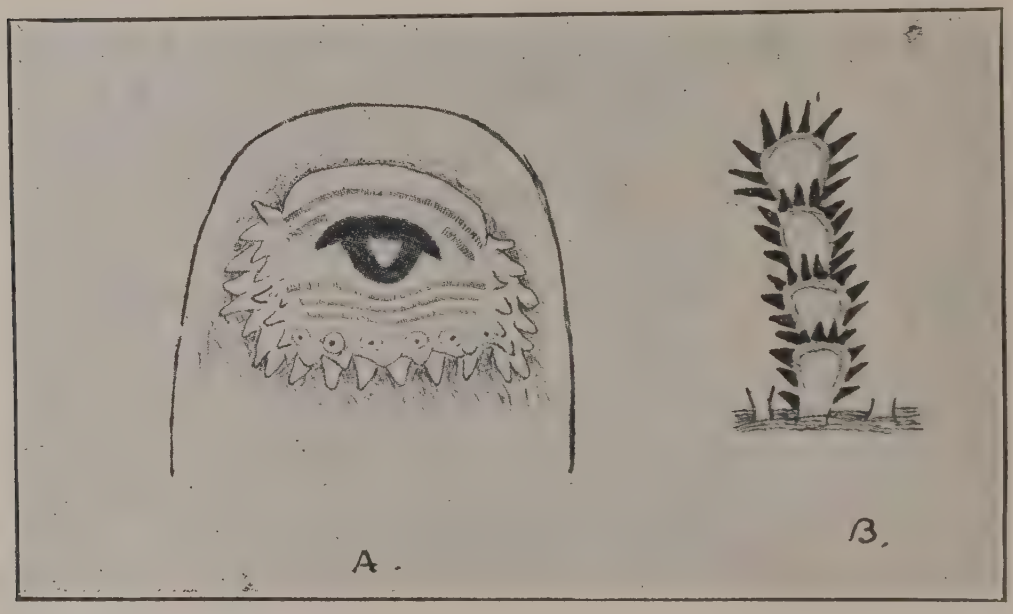


Fig. A. Mouth parts of the Tadpole.
Fig. B. A tier of teeth, showing the spikes, usually ten in number.

The tadpoles are small. The head and body strongly oval. The dorsa are either flat or only slightly convex : width of body greater than depth, not broadly rounded. Ventral surface flat. Eyes dorsolateral, not visible from below. Inter-orbital space equals or slightly broader than the distance between the eye and the tip of snout. Nostrils nearer tip of snout. Length of body about $\frac{1}{3}$ in the total length. Spiraculum slightly tubular, opening directed backwards and upwards, situated midway between the eye and the posterior extremity of body. Mouth disk well developed. Mouth ventral, broadly transverse, nearly $1\frac{1}{2}$ times the distance between nostrils and tip of snout. The upper lip distinctly arched, without papillæ. Sides of mouth and lower labial disk fringed with long finger-shaped papillæ which are in more than one row in the angles of the mouth. Horny beaks present ; the upper semilunar and the lower more or less U-shaped serrated. Dental formula $1\frac{1}{3}$. The inner upper row is broken very broadly. The lower series are all entire, sub-equal, except in badly preserved forms in which the innermost series may be

broken in the middle. The teeth under high magnification appear like a tier of shoe-horn-shaped structures fringed with spike-like processes. The lower labial disk bears, in addition to finger-like tactile processes, rounded smaller papillae with a central mass of melanin pigment. Anus tubular, dextral. Tail nearly twice the length of body. Caudal membranes weakly developed in front, but strongly marked posteriorly. Greatest depth of tail $\frac{1}{6}$ in the length. Terminal part of tail pointed or bluntly rounded, both membranes equally deep. A frontal gland is usually present. Glandular swellings in front of and rarely below the eyes. Minute rows of muciferous glands over the loreal region, continued from behind the eye on the sides of the body where occasionally two such rows are met with.

Dorsal surface of the body rufous black, ventral grey. Tail marbled or blotched.

Measurements of a larva in which the hind limbs are fully grown.

Total length	33 mm.
Length of body	23 mm.
Length of tail	23 mm.
Depth of body	5 mm.
Width of body	6 mm.
Depth of tail	4 mm.

The tadpoles were collected from the hill streams at Hebbe and Muthode, (Kadur, Mysore) at an elevation 4,000 ft., by Mr. A. Subba Rao. Specimens have been presented to the British and Indian Museums.

With a view to examine the larval teeth of the tadpole of *N. pygmœus* (Rec. Ind. Mus., 18, Vol. xv, p. 21, pl. 1, figs. 5, 5*a*), I requested the Director of the Zoological Survey of India to send me kindly a specimen, which, however bears teeth exactly like the figure given by Gadow (Camb. Nat. Hist. Amph. Rept. p. 58, 1909). I further understand that these tadpoles have been discovered to belong to *N. major* and not *N. pygmœus*.

NOTES ON THE HABITS OF SOME CEYLON BATS

BY

W. W. A. PHILLIPS.

MEGADERMATIDÆ.

Megaderma spasma ceylonensis.—The Ceylon Vampire Bat.

Singhalese—Tutica or Kokitan Voula. Tamil—Vava.

This is the common Vampire Bat of the Island. Its distribution is local but it is common in parts, especially in the Western Province.

It lives in colonies—generally of two to a dozen or so, but sometimes much larger—in the lofts of the better built native houses or in abandoned dwellings.

It always seems to select a house with a tiled roof, avoiding where possible one with only 'cadjans' or cocoanut leaf thatching. The Singhalese consider it unlucky to have these bats in their houses, but, owing to their religious teachings, will not kill them, and in some cases, will not even drive them out. Yet they seem to be only too glad to see other people do it for them. They sometimes complain that they are bitten at night by these bats, but this statement requires confirmation.

Owing to its very broad, cambered wings, it has a very silent nightjar like flight. It flies low, twisting in and out among the trees and light jungle surrounding the villages, and does not appear to come out into the open.

When disturbed and driven out of the houses it will take refuge in the surrounding palm trees; returning again as soon as the noise has subsided. It is rather difficult to get rid of, returning persistently to its chosen haunts.

The sexes live together all the year round, together with the young one which is produced in May. There is only one at a birth. The males always seem to be more numerous than the females.

Lyroderma lyra lyra.—The Indian Vampire Bat.

Singhalese—Tutica or Kokitan Voula. Tamil—Vava.

Rather uncommon and only occasionally met with. A few have been found in the Northern and Western Provinces. One on a tree on the north-west coast, a few in houses round Colombo, and a small colony (which used to inhabit an abandoned plumbago pit) in Kalutara. Another colony has been found in an abandoned house near Matugama in Kalutara. It seems to be chiefly composed of males. As with the *Megaderma*, the males seem to outnumber the females.

Two males kept in captivity in a large box-cage devoured a Dwarf Pepistrelle (*P. mimus*) which was put in with them consuming everything except the wing membrane. They also consumed a mouse (dead) and part of a young gerbille.

VESPERTILIONIDÆ.

Pipistrellus ceylonicus ceylonicus.—Kelaart's Bat.

Singhalese—Podi Voula or Kirri Voula. Tamil—Sinna Vava.

The present species is confined to the higher hills and does not seem to descend at all into the low country. It is very common in Dimbula and Dickoya (4,000 feet to 5,000 feet) on the Western side of the main range and also in Passara (3,500 feet) on the Eastern side. In the former districts it is almost the only bat to be seen flying about in the evening. It comes out early, almost as soon as the sun has set, and flies round bungalows and trees, dexterously hawking for insects. It does not fly particularly fast or high, but continually turns, twists and wheels in its flight. As the evening closes in, it appears to ascend higher and fly rather straighter. By day it hides in holes in trees, hollow

branches, etc., but does not hang suspended as do the *Rhinolophidæ* preferring to cling to the sides with feet and wing claws while retaining the head downwards position.

The sexes live together at any rate for the greater part of the year forming colonies of four or five to a dozen or more; the size of the colony, as usual, depending on the room available. Females have been found with young in September. Like others of the same genus it probably breeds more or less all the year round. Two, (sometimes only one) young are produced at a birth and are naked and blind when born.

Pipistrellus coromandra.—The Coromandel Pipistrelle.

Singhalese—Podi or Kirri Voula. Tamil—Sirra Vava.

This Pipistrelle seems to take the place of *P. mimus mimus* on the East side of the Island, its range stretching round to the South where it meets *P. mimus*. It is found both in the low country and in the Uva hills to at least 3,500 feet altitude. It is not found at all on the West coast. Its habits seem to be almost identical with those of the next species except that in the hills it probably lives more in hollow trees and branches. On the wing it is very easily confused with *P. mimus*.

Pipistrellus mimus mimus.—The Southern Dwarf Pipistrelle.

Singhalese—Kirri Voula. Tamil—Sinna Vava.

This is the smallest bat in the Island. The male, which is smaller and usually darker in colour than the female, is really minute for a mammal,though the wings give it an appearance of some size in flight. It is very common all over the Western and South-western portions of the Island and ascends the hills as far as Kandy. But in the East and South-east it gives place to the preceding species. It is especially common in Colombo and Kalutara.

In the evening it is usually the first bat to make its appearance, coming out as it does almost as soon as the sun has set. On first appearing, after circling once or twice round the bungalow or other building in which it has spent the day, it flies fairly high up into the sky, with quick wing beats and many twists and turns. As the evening closes in, however, it generally descends to about the level of the tree tops and continues hawking for insects along the edge of the jungles or over the paddy fields and clearings. It is rather a familiar little beast and the male especially,often comes into bungalows and hawks insects round the lamp. By day it hides in small colonies in bungalow roofs, living in the small space between the rafters and the tiles and in holes in walls of buildings. Here it may easily be caught by hand, as it is not particularly quick at taking flight and escaping. It does not hang head downwards, as the majority of bats do, but lies on the rafter, head up, grasping it with all its claws.

At certain seasons of the year the females and young live together by themselves, but at other times the males are found in the same colony. They (the males) are always much less common than the females. When disturbed during the day this bat will fly round for sometime and return later if possible to the same quarters ; but should this be prevented it will seek others in another part of the building or occasionally settle in a tree until all danger is past. When settling in a tree it has been observed to pitch on a leaf, head up, and grasp the leaf stalk with its wing claws, in which position it remained until captured. It seems to breed more or less all the year round. Females with young have been found in March, May and December. The mother has either one or two young (at a birth) which are born naked, blind, and helpless, but with the instinct to cling to the mother's breast. They accompany her on her flights abroad until they become too heavy and are old enough to be left behind. A mother seen by day, with two large young attached to her pectoral mammæ flew just as agilely as usual, though she was rather slow in taking off and a little laboured in gaining height. At the time the young are born the males seem to live separate from the colony and may then sometimes be found solitary on palm-trees hiding

beneath the hanging dead leaves. The probable explanation, why this species rarely lives in holes in tree trunks, etc. in the low country, is that it is afraid of attacks by the large Monitor lizards which are good tree climbers and often enter woodpeckers and other birds' nesting holes.

Hesperopterus tickelli.—Tickell's Bat.

Singhalese—Podi or Kirri Voula. Tamil—Vava.

Locally distributed, but very common in parts. In the rubber districts of Kalutara, this is the commonest bat seen in the evenings; being very noticeable as it always appears so early, and haunts tennis courts, bungalow clearings and the like. Along the actual sea coast and in the Palm-belt which runs from Colombo to Galle, however, it is rarely found, its place being taken by the stronger and larger *Scotophilus khuli.* It has also been recorded from Anuradhapura, but does not seem to be so common in that district. It probably does not ascend the hills to any very great altitude. In the evening it appears early, quickly following the little Dwarf Pipistrelle, (*P. mimus,*) but unlike that species, it has a definite beat to which it returns night after night, at the same time almost to the minute. The beat, which is usually close along the trees on the edge of a clearing, is jealously guarded from intruders of its own species, which are chased and hunted out of the territory. When two bats are observed on the same ground, they are almost sure to be male and female, for at certain seasons they seem to fly together. Its flight is rather slow and steady, beating up and down the territory or wheeling in large circles some twenty or thirty feet up, with an occasional swoop down nearly to the ground. It flies silently, but has a shrill squeaking cry which is occasionally uttered when wounded. By day it hides away in jungles, presumably in hollow trees or like places, but it is very difficult to discover its retreats. The young, (one only) is produced at the end of May and is very large at birth.

Scotophilus khuli.—The Common Yellow Bat.

Singhalese—Podi Voula. Tamil—Vava.

Like the preceding species this Bat seems to be very locally distributed, being common in some parts, rare in others.

In the Western province it is extremely numerous in the Palm-belt running along the coast from Colombo to Galle, but, inland of this, it is seen more rarely;—though, as it appears late in the evening, it is easily overlooked and likely to seem more rare than it really is. It seems to prefer the neighbourhood of Cocoa-nut palms and is always more numerous where they abound. It appears rather late in the evening, just before it is quite dark and usually flies rather low down, not more than ten or fifteen feet up. It likes large open spaces, (preferably near Palm trees), paddy fields, the foreshore on the coast, roads and canals, railways, etc., up and down which it flies quite straight for several hundred yards before turning and retracing its path. It will often fly quite low down, within a foot or two of the ground, at a fairly rapid, though steady pace, with few twists or turns. It flies silently. There is a great deal of variation both in size and colour in this species. Typically it is yellowish brown, rather lighter and more yellowish underneath, but bright chestnut specimens are common and small greyish ones not rare. All these different varieties are found in the same localities and apparently live together.

MINIOPTERINÆ.

Miniopterus fuliginosus.—The Long-winged Bat.

Singhalese—Kirri Voula or Podi Voula. Tamil—Sinna Vava.

This species seems to prefer a fairly dry climate. It is common in the Uva province, on the Eastern slopes of the hills, to 3,500 feet altitude and in the North Central province (600 feet); but is entirely absent from the Kalutara district of the Western province and from the Western slopes of the hills where the climate is very much damper. It appears fairly early in the evening, flying rapidly and

fairly straight, about 30 feet to 40 feet up. Though rapid in flight its pace cannot be compared with that of either the *Taphozous* or *Saccolaimus* which far excel it, flying as they do with almost Swift-like flight. On the wing, in the early evening, it may easily be recognised and identified by its tail which is proportionally longer than in any other bats.

EMBALLONURIDÆ.

Taphozous melanopogon.—The Black-bearded Sheath-tailed Bat.
Singhalese—Podi Voula. Tamil—Sinna Vava.

This bat has only recently been found in Ceylon. In August 1920 a large colony was discovered in some rocks near a Singhalese village (about half a mile from the sea) in Kalutara on the West Coast. The Colony was composed of males, females and young of all ages, numbering some forty or fifty altogether. They were living in the fissures and crevices of a large piled mass of rocks and boulders, partly overgrown with brush-wood, such as is common all over the Western low country. When first found, although the morning was well advanced and the sun blazing down, the bats were quite lively, many of them continually flying up and down and in and out of the caves and overhanging rocks, uttering their shrill squeaking cry the while. On alighting after a short fly round, they would clutch the rock wall with the hind feet and hooks on the wings, hanging head downwards, and would run swiftly backwards up the rock into a fissure a yard or more away.

For a bat they are wonderfully agile when in this prone position ; the way they run into and hide in the crevices and fissures of the rock reminds one greatly of the small crabs which swarm on the rocks by the seashore, which they much resemble in some of their movements. On being disturbed many flew away among the Cocoanut palms, uttering a shrill cry, very like that of the *Saccolaimus*, though perhaps not quite so highly pitched, while others hid deep down in holes and fissures of the rock.

The two sexes were there in about equal numbers. In September many of the females had young clinging to them, while other young ones almost full-grown were hiding in the crevices. Some females examined had one young apiece, the young being naked and blind when born. The flight of this species is very rapid, like that of the *Saccolaimus* and its habits on the wing are probably almost the same as those of that species. When returning to its quarters it circles round high overhead, suddenly dropping with a rush of wings and swooping down alights on the rock in the head downwards position with its partially extended wings resting against the wall. Then looking round it either runs backwards into a crevice or takes flight again and has another try. Of the males examined, all but one had the black beard from which the species takes its name. This one individual, however, had no sign of any darkening of the throat, though there is no reason to suppose it was not breeding like the rest. The haunts of this species very soon become foul, and have a curious unpleasant musty smell rather different to that of the *Rhinolophidæ*, due presumably to the accumulated droppings.

Taphozous longimanus.—The Long-armed Sheath-tailed Bat.
Singhalese—Podi Voula. Tamil—Vava.

A rather uncommon species which, so far, seems to have been recorded only from the Kalutara district. By day it hides, singly or in pairs, in the crowns of Cocoanut palms, usually choosing a tall tree with a few dead leaves hanging down against the trunk. It either creeps in behind the leaf stem or more rarely hangs on to the trunk behind one of the dead leaves. The Singhalese often disturb them when they are ascending the trees to pluck the cocoanuts and can usually point out the trees to which they are partial.

It comes out fairly early in the evening, following close upon the *Saccolaimus*, which it must resemble in flight ; but from which it can be distinguished, if

the light is sufficiently good, by the much lighter colour of the wing membrane and its slightly smaller size.

It generally flies silently but has a cry which it uses on occasions which to the human ear is identical with that of the *Saccolaimus*. When wounded and on the ground it utters a shrill piercing squeak which, not only attracts others of its own kind but also many *Saccolaimus*, which come swooping down out of the darkening sky with a rush of wings, dashing past within a foot or two of the ground and ascending again into the blue. In like manner it will answer to the cry of the wounded *Saccolaimus*. Individuals differ much in colour. Some specimens being a light cinnamon brown, while others are of a greyish ash.

Saccolaimus saccolaimus.—The Pouch-bearing Sheath-tailed Bat.

Singhalese—Podi Voula. Tamil—Vava.

A fairly common bat evenly distributed over the greater part of the low country and ascending the hills in the Uva province, to at least 3,500 feet.

It leaves its day hiding place early in the evening, mounting swiftly into the sky with steady powerful wing strokes, then, having gained an altitude of three or four hundred feet, it commences to feed, twisting and turning and flying round in larger or smaller circles, or streaking off over the rubber and jungle for a mile or two in some direction. It flies wonderfully rapidly, and, with its long rather pointed wings, might easily be mistaken for a Swift, with numbers of which it may often be seen flying in the evening sky. In fact it might well be described as the Swift of the Bat world.

As the evening closes in, it generally drops to a rather lower altitude, following the insects on which it feeds; but this seems to depend largely on the weather conditions as on certain evenings it will continue to fly high until it is quite dark. Occasionally as it flies along, it will swoop down almost to the ground, quickly mounting again into the skies.

As it flies or swoops it continually utters a shrill squeaking cry, which always heralds its approach. It rarely flies silently.

When wounded, too, and lying on the ground, it utters this peculiar cry, which then attracts all its comrades, flying within hearing. These come dashing down, swooping to within a foot or two of the ground, circling up and swooping down again continually—they too uttering the same call. A few *T. longimanus* will also answer to it.

During the day it lives in small companies of five or six, of both sexes, in hollow trees, usually choosing an old hollow decayed and broken off Kitul palm. Here it lives, some way down, clinging to the sides, head downwards, with feet and wing claws. When disturbed it runs backwards up to the entrance, where it hangs for a few moments, before taking flight, in order to ascertain the cause of the disturbance.

Females have been found with young early in September in October and in November. They bring forth only one at a birth.

BIRDS OF PACHMARHI.

By

B. B. Osmaston.

(With two plates.)

The Station of Pachmarhi is situated in North Latitude $22\frac{1}{2}^{\circ}$, East Longitude $78\frac{1}{2}^{\circ}$, on a plateau in the Satpura Hills, the Highlands of Central India, at an elevation of about 3,500 feet above Sea level. This plateau, which is about 7 square miles in extent, is surrounded by a number of hills, the highest of which, Dhupgarh, attains a height of nearly 1,000 feet above the plateau. The surrounding country which is much broken up by precipitous gorges and ravines includes some of the most beautiful scenery in India. The deeper ravines all contain perennial streams, with a moist tropical flora including tree ferns. The flora of the plateau and surrounding hills consists in part of rather open mixed deciduous forest, broken up by grassy glades, and in parts of Sal forest.

The rock is a red sandstone. The climate is cool for 9 months in the year, and hot only from about the middle of March to the middle of June.

The rainfall is about 75 inches, nearly all of which falls between 20th June and 20th September, the monsoon months, which are rainy, misty and cool.

In the following list the numbers are those of the birds in the Fauna of Britsh India.

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4. *Corvus macrorhynchus.*—The Jungle Crow.
   Common in and around Pachmarhi where it breeds in April.
7. *Corvus splendens.*—The Indian House-Crow.
   Very common in Pachmarhi. Breeds in June.
16. *Dendrocitta rufa.*—The Indian Tree-pie.
   Very common on the plateau. Breeds April—May.
31. *Parus atriceps.*—The Indian Grey Tit.
   Fairly common. A resident.
43. *Machlolophus haplonotus*—The Southern Yellow Tit.
   Rather more numerous than the last. Also resident, breeding in April—May.
107. *Argya malcolmi*—The Large Grey Babbler.
   Not found on the Pachmarhi plateau proper, but occurs on the adjoining plateau near the Begum of Bhopal's Bungalow.
110. *Crateropus canorus.*—The Jungle Babbler.
   Extremely common in the Station and all over the plateau.
121. *Pomatorhinus obscurus*—Hume's Scimitar Babbler.
   This bird is not found on the Pachmarhi plateau or surrounding hills or valleys with the exception of Dhupgarh, where it is common in the thick strobilanthes cover near the summit.
135. *Dumetia hyperythra*—The Rufous-bellied Babbler.
   Rather rare on the slopes of the hills below Pachmarhi at about 2,500 feet.

139. *Pyctorhis sinensis*—The Yellow-eyed Babbler.
Occurs in Pachmarhi, where it breeds in July. Not common.

144. *Pellorneum ruficeps*—The Spotted Babbler.
Fairly common in shady ravines. Breeds May—June. Has a very characteristic and pretty song, distinct from its call of four notes. Keeps largely to the ground.

164. *Alcippe phœocephala*—The Nilgiri Babbler.
Not uncommon, chiefly in ravines. Moves restlessly from tree to tree. Has a pretty short song of 7 or 8 notes. Breeds early in July, laying 3 very beautiful pale pink eggs with claret streaks and blotches.

189. *Myiophoneus horsfieldi*—The Malabar Whistling Thrush.
This is the whistling School-boy of the residents of Pachmarhi. It is common in all the ravines in these hills. Its song is remarkably fine, consisting of a wide range of pure and clear very human notes and is far superior to that of its Himalayan cousin. It breeds from the 15th June, at the break of the rains, the nests being placed in small crevices in more or less vertical rocks in narrow shady ravines often over water.

226. *Zosterops palpebrosa*—The Indian White-eye.
Very common and resident. Breeds chiefly in July.

245. *Ægithina nigrilutea*—Marshall's Iora.
Fairly common in and around Pachmarhi where it breeds in July.
Has a number of fine clear notes, resembling, but distinct from, those of *Ætiphia*.

252. *Chloropsis jerdoni*—Jerdon's Chloropsis.
Common in the station and particularly noticeable from May to July. Frequents loranthus-infested trees.
Has a few characteristic notes, different from *C. aurifrons*. Also mimics other birds, especially the King-crow and Shikra.

278. *Molpastes hæmorrhous*—The Madras Red-vented Bulbul.
Very common in Pachmarhi station where it breeds in gardens, etc., from May to August. Rare in surrounding jungles.

289. *Otocompsa fuscicaudata*.—The Southern Red-whiskered Bulbul.
Common in the forests and ravines round Pachmarhi; rare in the station, except in winter. Breeds April to July, laying usually 3 eggs.

290. *Otocompsa flaviventris*—The Black-crested Yellow Bulbul.
Somewhat rare in the valleys round Pachmarhi, where it undoubtedly breeds.

321. *Sitta castaneiventris*—The Chestnut-bellied Nuthatch.
Common in Pachmarhi where it breeds in April-May.

327. *Dicrurus ater*—The Black Drongo.
Only once seen in Pachmarhi.

330. *Dicrurus cœrulescens*—The White-bellied Drongo.
This is the common king crow of these hills. It breeds in March-April. Some of the notes of this bird are very fine and meruline in character.

340. *Dissemurus paradiseus*—The Larger Racket-tailed Drongo.
Rarely seen on the plateau, commoner down below.

374. *Orthotomus sutorius*—The Indian Tailor-bird.
Common in the station and in forest.

381. *Cisticola cursitans*—The Rufous Fantail Warbler.
Not common. Saw several in the rains on the plateau near Reech-Ghur.

382. *Franklinia gracilis*.—Franklin's Wren-Warbler.
Not uncommon on the plateau—a resident.

VIEWS OF PACHMARHI.

408. *Phylloscopus indicus*—Olivaceous Willow-Warbler.
A winter visitor. I can confirm the habit, observed by Blanford, of moving about the vertical trunks of trees like a nuthatch.

Note.—There are other species of *Phylloscopus* which are winter visitors to Pachmarhi.

424. *Acanthopneuste magnirostris*—The Large-billed Willow-Warbler.
Passes through Pachmarhi in September, when its characteristic 6-noted call may be heard, especially near Dhupgarh.

464. *Prinia socialis*—The Ashy Wren-Warbler.
Pachmarhi. Not very common. Breeds in August.

466. *Prinia inornata*—The Indian Wren-Warbler.
Pachmarhi. Not common.

473. *Lanius vittatus.*—The Bay-backed Shrike.
A rather rare winter visitor.

476. *Lanius erythronotus*—The Rufous-backed Shrike.
Not common in Pachmarhi, but occasionally seen on the Plateau in the winter.

488. *Tephrodornis pondicerianus*—The Common Wood-Shrike.
A common bird. Breeds in May.

490. *Pericrocotus speciosus*—Indian Scarlet Minivet.
Not common. May be seen occasionally in small flocks, feeding in trees.

500. *Pericrocotus peregrinus*—The Small Minivet.
Very common on the plateau. Breeds in April—May.

510. *Graucalus macii*—The Large Cuckoo Shrike.
Common on the plateau. Breeds in April.

521. *Oriolus melanocephalus*—The Indian Black-headed Oriole.
Common on the plateau, and below. Breeds in May, laying usually two eggs only.

528. *Pastor roseus*—The Rose-coloured Starling.
Occasionally seen in small flocks in the spring.

549. *Acridotheres tristis*—The Common Myna.
Very common in and around the station.

561. *Siphia parva*—The European Red-breasted Flycatcher.
A fairly common, cold weather visitor, arriving in October—November.

576 *Cyornis tickelli*—Tickell's Blue Flycatcher.
This is the common flycatcher of the woods and ravines round Pachmarhi. It is a resident species with a pretty short song of 5 or 6 notes. Breeds in holes in rocks in early June, laying 4 eggs.

579. *Stoparola melanops*—The Verditer Flycatcher.
An occasional winter visitor. Observed in the station in October.

592. *Culicicapa ceylonensis*—The Grey-headed Flycatcher.
Common in ravines and by streams. Breeds in June—July

598. *Terpsiphone paradisi*—The Indian Paradise Flycatcher.
Rarely seen on the plateau. Common in the more open low valleys, where they breed.

601. *Hypothymis azurea*—The Indian Black-naped Flycatcher.
Not uncommon in ravines where they breed end of June and early July.

604. *Rhipidura albifrontata*—The White-browed Fantail Flycatcher.
Fairly common in Pachmarhi in the cold weather but does not breed there.

606. *Rhipidura pectoralis*—The Spotted Fantail Flycatcher.
Common in the ravines round Pachmarhi. Breeds in April-May.

608. *Pratincola caprata*—The Common Pied Bushchat.
Common on the plateau.

610. *Pratincola maura*—The Indian Bush Chat.
A winter visitor.

644. *Ruticilla rufiventris*—The Indian Redstart.
A common winter visitor.

647. *Cyanecula suecica*—The Indian Blue-throat.
An occasional winter visitor.

661. *Thamnobia cambaiensis*—The Brown-backed Indian Robin.
Fairly common in the station.

663. *Copsychus saularis*—The Magpie Robin.
Very common in and around the station.

685. *Geocichla cyanonotus*—The White-throated Ground Thrush.
Not uncommon in the open valleys and ravines below Pachmarhi.

693. *Petrophila cyanus*—The Western Blue Rock-Thrush.
Occasionally seen in the Winter.

734. *Uroloncha malabarica*—The White-throated Munia.
Occasionally seen in the plateau.

775. *Gymnorhis flavicollis*—The Yellow-throated Sparrow.
Exceedingly common everywhere.

776. *Passer domesticus*—The House Sparrow.
Common in and about the station.

803. *Melophus melanicterus*—The Crested Bunting.

811. *Ptynoprogne concolor*—The Dusky Crag-Martin.
Common around rocky precipices *e.g.*, Monte-Rosa where it breeds.

823. *Hirundo erythropygia*—Sykes' Striated Swallow.
A-red-rumped swallow which I take to be this species is not rare in Pachmarhi, where it breeds.

827. *Motacilla leucopsis*—The White-faced Wagtail.
A common winter visitor on the plateau, arriving in October.

832. *Motacilla melanope*—The Grey Wagtail.
A common winter visitor on the plateau as well as in ravines. Arrives about 1st September.

841. *Anthus maculatus*—The Indian Tree-Pipit.
Very common in the cold weather, leaving in April.

847. *Anthus rufulus*—The Indian Pipit.
Common on the plateau where it breeds in April and May.

895. *Arachnecthra asiatica*—The Purple Sun-bird.
Common everywhere, especially in the station. Breeds April to June.

921. *Piprisoma squalidum.*—The Thick-billed Flower-pecker.
Very common throughout the plateau. Frequents loranthus, for the spreading of which it is mainly responsible. Breeds April-May.

933. *Pitta brachyura*—The Indian Pitta.
I have not seen a Pitta in Pachmarhi during the 2 years I have spent there, but I have it on good authority that this species does rarely visit the station.

972. *Liopicus mahrattensis*—The Yellow-fronted Pied Woodpecker.
Not uncommon on the plateau.

976. *Iyngipicus hardwickii*—The Indian Pigmy Woodpecker.
Not rare. Breeds in March-April.

986. *Brachypternus aurantius*—The Golden-backed Woodpecker.
Common on the plateau and often seen in the station.

1008. *Thereiceryx zeylonicus*—The Common Indian Green Barbet.
Very common everywhere. Breeds in April-May..

1019. *Xantholæma hæmatocephala*—The Crimson-breasted Barbet or Coppersmith.
Common. Breeds in April.

1022. *Coracias indica*—The Indian Roller.
Common on the plateau. Breeds in April-May.

1031. *Nyctiornis athertoni*—The Blue-bearded Bee-eater.
Heard the characteristic guttural call of this species on one occasion in May near Dorothy Deep. Have never seen or heard this bird again.

1033. *Ceryle varia*—The Indian Pied Kingfisher.
Occasionally seen around the Pachmarhi lake.

1035. *Alcedo ispida*—The Common Kingfisher.
Not uncommon along streams both on the plateau and in ravines. A resident species.

1044. *Halcyon smyrnensis*—The White-breasted Kingfisher.
Common on the plateau where it breeds in April-May.

1062. *Lophoceros birostris*—The Common Grey Hornbill.
Very common on the plateau, especially in the spring months.

1067. *Upupa indica*—The Indian Hoopoe.
Common on the plateau. Breeds in April.

1073. *Cypselus affinis*—The Common Indian Swift.
Common in the station where it breeds.

1086. *Macropteryx coronata*—The Indian Crested Swift.
Occasionally to be seen flying over in the spring and hot weather, but this species is not a resident.

1095. *Caprimulgus indicus*—The Jungle Nightjar.
This is the only nightjar found in Pachmarhi. It frequents rocky ground, and may be heard calling in the evenings in April and May. They breed from April to June.

1104. *Cuculus canorus*—The Cuckoo.
Rare-occasionally heard in April on spring migration.

1107. *Cuculus micropterus*—The Indian Cuckoo.
Rare. Occasionally heard in April or May.

1109. *Hierococcyx varius*—The Common Hawh-Cuckoo or "Brain-fever Bird."
Common on the plateau and very noisy from March to August. This is the only cuckoo which breeds in Pachmarhi, except perhaps the next.

1120. *Eudynamis honorata*—The Koel.
Not common but occasionally heard during the hot-weather and rains.

1130. *Centropus sinensis*—The Common Coucal or Crow-Pheasant.
Not very common, but occurs as a resident.

1135. *Palæornis nepalensis*—The Large Indian Paroquet.
Common in the surrounding forest.

1138. *Palæornis torquatus*—The Rose-ringed Paroquet.
Very common.

1139. *Palæornis cyanocephalus*—The Western Blossom-headed Paroquet.
Common in and around the station.

1152. *Strix flammea*—The Barn-Owl.
Not common. Saw one sitting in a dark hole in the rock in Reech-Ghar.

1164. *Ketupa zeylonensis*—The Brown Fish-Owl.
Found in some ravines *e.g.*, Jumboo Deep.

1168. *Bubo bengalensis*—The Rock Horned Owl.
Frequents rocky ravines.

1173. *Scops giu*—The Scops Owl.
Not uncommonly heard in the station.

1178. *Scops bakkamœna*—The Collared Scops Owl.
Common in the Sal Forest where its monotonous call, "kurook—took" is repeated after dark at regular intervals ad infinitum.

1180. *Athene brama*—The Spotted Owlet.
Occurs, but is not common.

1184. *Glaucidium radiatum*—The Jungle Owlet.
Common in the forest. Breeds in April-May.

1191. *Otogyps calvus*—The King Vulture.
Not uncommon.

1192. *Gyps fulvus*—The Griffon Vulture.
Common and resident. Breeds on the cliffs.

1194. *Gyps indicus*—The Indian Long-billed Vulture.
Common. Similar habits to the above.

1196. *Pseudogyps bengalensis*—The Indian White-backed Vulture.
Occasionally seen with other vultures. Does not breed on the Plateau.

1197. *Neophron ginginianus*—The Scavenger Vulture or—Pharoah's Chicken.
Common in and around Pachmarhi. Breeds on the cliffs.

1203. *Aquila vindhiana*—The Indian Tawny Eagle.
An occasional visitor.

1207. *Hieraëtus fasciatus*—Bonelli's Eagle.
Not common.

1212. *Spizaëtus limnœtus*—The Changeable Hawk-Eagle.
Occasionally seen in the open forest round the Station.

1217. *Spilornis cheela*—The Crested Serpent-Eagle.
Fairly common in the forest round.

1220. *Butastur teesa*—The White-eyed Buzzard Eagle.
Found in the plateau. Not common.

1229. *Milvus govinda*—The Common Kite.
Common in the Station.

1233. *Circus macrurus*—The Pale Harier.
Occasionally seen on the plateau in the cold weather.

1244. *Astur badius*—The Shikra.
Common on the plateau where they breed in April-May. Nests usually placed in Jamun or Terminalia trees. Eggs four.

1249. *Pernis cristatus*—The Crested Honey Buzzard.
Fairly common, nesting in large trees and laying one or two eggs. The rock bees, upon which they largely feed, leave the Pachmarhi hills during the rainy season and I think the Honey Buzzards go away too.

1255. *Falco peregrinator*—The Shahin Falcon.
Saw a pair of these birds which were evidently breeding on the cliffs near "Big falls".

1257. *Falco jugger*—The Laggar Falcon.
Occasionally seen on the plateau.

1265. *Tinnunculus alaudarius*—The Kestrel.
Occurs as a winter visitor.

1271. *Crocopus phœnicopterus*—The Bengal Green Pigeon.

1272. *Crocopus chlorogaster*—The Southern Green Pigeon.
Both the above species are common around Pachmarhi.

1283. *Sphenocercus sphenurus*—The Kokla.
A very rare visitor. Saw this species and heard its unmistakable call near the polo-ground in April.

BIRDS OF PACHMARHI.

VIEWS OF PACHMARHI.

1292. *Columba intermedia*—The Indian Blue Rock-Pigeon.
Very common, breeding about April on the cliffs round Pachmarhi.
1304. *Turtur orientalis*—The Rufous Turtle Dove.
1305—*Turtur ferrago*—The Indian Turtle Dove.
I have seen both the above species in and around Pachmarhi. I. have only heard *one* kind of call, which is a 5 noted call exactly similar to that of the Himalayan bird (*Turtur ferrago*). I have seen and heard birds in every month of the year but they are commonest in the cold weather months.
1307. *Turtur suratensis*—The Spotted Dove.
Common in and around the station.
1324. *Pavo cristatus*—The Common Pea-fowl.
Found, but not in large numbers on the slopes below the plateau where they also breed.
1330. *Gallus sonnerati*—The Grey Jungle Fowl.
Not numerous. Found in similar localities to the Pea-fowl, and sometimes as high as Dhupgarh (4,400 feet).
I may here mention that the Red Jungle fowl reported by Forsyth as being found in the vicinity of Pachmarhi is no longer found there.
1349. *Galloperdix spadicea*—The Red Spur-fowl.
Common around Pachmarhi. Breeds in June, laying 3 eggs under shelter of a rock or tree trunk.
1350. *Galloperdix lunulata*—The Painted Spur-fowl.
Common around Pachmarhi on rocky slopes.
1357. *Perdicula asiatica*—The Jungle Bush Quail.
Does not occur on the plateau proper, but is found on the neighbouring plateau beyond the Begum of Bhopal's Bungalow.
1382. *Turnix pugnax*—The Bustard Quail.
Occasionally flushed in the grassy blanks in the open scrub jungle around Pachmarhi, where it doubtless breeds.
1418. *Œdicnemus scolopax*—The Stone Curlew.
Occurs on the plateau. Not common.
1431. *Sarcogrammus indicus*—The Red-wattled Lapwing.
Found on the plateau along the " Waingunga " and near the lake where they breed.
1460. *Totanus hypoleucus*—The Common Sandpiper.
A winter visitor.
1484. *Gallinago cœlestis*—The Common Snipe.
Found in swampy ground on the plateau. Not common.
1548. *Dissura episcopus*—The White-necked Stork.
Saw a pair in the rains by a temporary pool near the Hogs Back.
1565. *Ardeola grayi*—The Paddy Bird.
Fairly common by the lake.
1597. *Nettium crecca*—The Common Teal.
Occasional winter visitor on the lake.

NEST BOXES FOR BIRDS.

BY

S. H. PRATER, C.M.Z.S.

WITH A NOTE BY H. WHISTLER, F.Z.S., M.B.O.U., C.F.A.O.U.

(With 2 plates.)

The following letter was received from Mr. H. Whistler on the subject of "Nest boxes for Birds." Mr. Whistler writes:—

A TRANSPORTED NESTING SITE IN A KNOT HOLE.

"Have any of our members "attempted to do anything in "India in the direction of putting "up nesting boxes for wild birds? "It is a common practice in "England and is there usually "attended with much success, "and there seems no reason why "the same thing should not be "done in this country, in the "hills at any rate. Some years "ago I put up a few boxes in my "garden at Rawalpindi but the "boxes were not very carefully "made and were only used by "Mynahs. A pair of Rollers "made great endeavours to "adopt one box but it was mani-"festly too small for them. I "cannot however help thinking "that in the plains such nest boxes would suffer rather heavily from the "multitude of squirrels, lizards, and similar pests that destroy so many nests "in normal situations.

"In the hills nest boxes should be more successful: there are a larger "number of small and interesting species likely to adopt them, and at the "same time their list of natural enemies should be smaller. Being this year, "for the first time with a settled house in the hills, in Lower Dharmsala, I "made an experimental start.

"Thirteen boxes in all were prepared; one of these was an ordinary packing "case, boarded up with a small square entrance, and intended really for owls. "The other twelve were small square Martini-Henry ammunition boxes with a "small circular hole in the lid which was screwed down only lightly to admit of "opening and examination. These boxes were affixed to small cross pieces of "board so that they might be tied in a sideways position to the trunks of trees.

"The boxes were placed in 3 localities; the packing case and 4 ammunition "boxes were put up in my garden at 4,000 feet altitude. The remainder were "placed in two patches one at 5,000 feet and the other at about 9,000 feet. "These last two groups were however not under my personal surveillance and "no success was reported from them. This may have been due to faulty "administration or to the fact that both batches were in oak forest (*Quercus "incanus, Q. semicarpofoliata*); such oaks provide a multitude of natural nesting "sites much in excess of the number of birds likely to want them.

"The boxes in my garden were sufficiently successful to shew that much "might be done in this line. I was away on tour from 10th May to 10th July "and was therefore unable to watch the results properly but the following use

NEST BOXES FOR BIRDS.

FIG. 1.

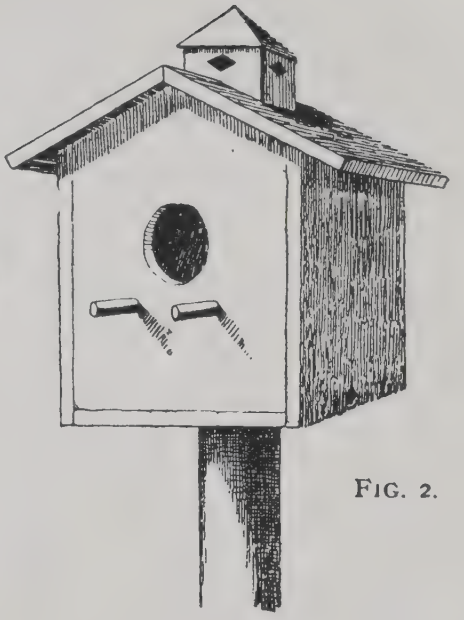

FIG. 2.

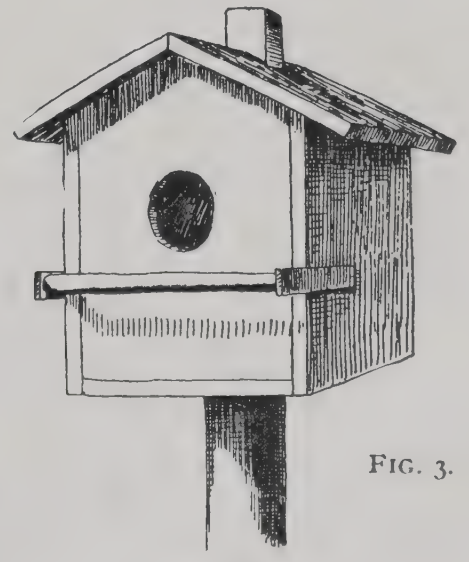

FIG. 3.

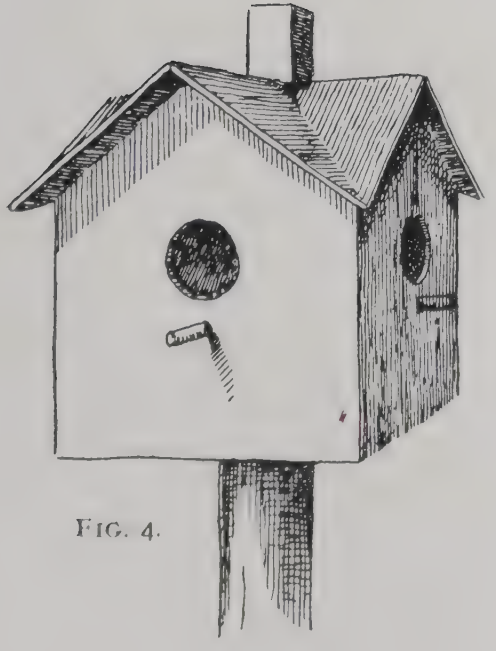

FIG. 4.

FIG. 5.

SUGGESTIONS FOR BIRD BOXES.

(Plates I and II are reproduced from the Bulletin of the Nat. Asc. of Audubon Societies, New York, and were originally published in the Teacher's Leaflet, College of Agriculture, Cornell University.)

"was to my knowledge made of the boxes. The garden is a large one, "consisting of a small grove of chil pines, *Pinus longifolia*, at the head of a "long slope of slightly terraced ground, partly used for flowers and partly for "vegetables but including a good deal of fallow ground and clumps of bushes. "Large trees grow all round the hedge and various trees are dotted about, "some of large size.

(1) "Packing case; this was fixed up at the junction of the main "branches of a very fine Chil Pine and by the 27th April it had been "adopted by a pair of Mynahs (*Acridotherus tristis*) and young were "hatched during May.

(2) "Box 1. Placed half way up a Pear tree in the centre of the garden. "I saw no sign that it had been adopted by any bird until an inspec- "tion on the 1st May revealed a nest with 4 hardset eggs of the "Magpie Robin (*Copsychus saularis*). These hatched a few days later "and were doubtless safely reared.

(3) "Box 2. Placed near the top of a tree of unknown species, but open "and light in character. During the last ten days of April it was "continuously being inspected by 3 species, the Brahminy Mynah "(*Temenuchus pagodarum*), the Magpie Robin, and the Yellow— "throated sparrow (*Gymnorhis flavicollis*). Whether one of these "used it early in the season I cannot say but on my return on 10th "July I found that it contained 4 naked young of the Brahminy "Mynah which were duly fledged.

(4) "Box 3. Placed high up in a tree of the Chil Pine grove. When I "left, on 10th May this contained a nest of the Yellow-throated "Sparrow which was then empty.

(5) "Box 4. Placed half way up a small solitary Chil Pine. This con- "tained 4 incubated eggs of the Brahminy Mynah on my return on "10th July.

"The above amount of success has determined me to pay more attention to "the placing of nest boxes next spring if possible, and I should be interested "to hear the experiences of any other member of the society who has tried nest "boxes in India. It is hardly necessary to remark that apart from the general "interest of these experiments they afford an excellent means of obtaining "several little known particulars of our Indian birds, such as length of "incubation, fledging periods, and the down plumages of the young."

The question of attracting birds about the home by providing feeding stations in winter and nesting boxes in summer is one that has attracted considerable attention in England and America. Associations like the National Association of Audubon Societies, The Foreign Bird Club, and others have been responsible in a large measure for popularising these methods of attracting our avian neighbours and their efforts have met with a welcome response from Bird Lovers all over the country. There seems to be no reason why attempts of a similar nature should not be made in India. Mr. Whistler describes the considerable measure of success attained by him in putting up nesting boxes in his garden. It is certain that there are a number of our members who would be willing to interest themselves in this fascinating venture which by the infinite pleasure and instruction it affords repays so fully the small amount of trouble and time expended on it. Success may not come at once as it is quite possible that the birds may not respond very promptly to the first attempt but there is no reason to suppose that persistent and intelligent effort will not bring its ultimate reward. A large variety of birds frequent the vicinity of bungalows and gardens and many of these welcome neighbours might be coaxed into tenanting the artificial nesting sites prepared by their would-be landlords. In endeavouring to attract any particular species it must be remembered that the type of the nest which will be most

readily adopted is the one that most closely resembles the natural nesting site of the bird. There are certain species which are in no way particular as to the site or the architecture of their dwellings, in this connection one need hardly mention the ubiquitous sparrow who can almost be considered as an enemy of the enterprise. Crows and tree-pies, and other birds of ill repute with egg robbing proclivities, must also be included in the category. Among the birds which naturally nest in cavities such as one afforded by nest boxes we might mention Tits, Nuthatches, Tree Creepers, Mynahs, Grackles, Bush Robins, Magpie Robins, The Large Pied Wagtail, Woodpeckers, Barbets, Rollers, Paroquets, Owls and Owlets.

The bulletin of the National Association of Audubon Societies for March 1914 contains a very interesting series of papers on the subject of attracting birds about the home. Among the various subjects treated is an article by Beecher S. Bowdish on the subject of putting up bird boxes. Mr. Bowdish gives some very valuable advice on the making of bird-boxes and his article is illustrated by a series of diagrams which we have taken the liberty of reproducing (they were originally issued by the College of Agriculture, Cornell University) in the hope that members will find them useful in designing nesting boxes. In the course of his remarks on the preparation of these boxes Mr. Bowdish says :—

> " The most natural bird homes, and such as may often be provided with the least trouble, are pieces of hollow limbs or small hollow trunks of trees, or the old nesting holes of woodpeckers. If no limbs with suitable cavities are found, they may be made by taking a piece of limb, about 8 inches in diameter and fourteen to sixteen inches long, dividing it in half, with a rip saw, from one end to within about three inches of the other, where it is met by a right-angle cut from the side. At this point an entrance hole is made through the shorter or front half. The two halves are then hollowed out so as to form a cylindrical cavity about three and one and-a-half inches in diameter and 10 inches deep, when the two halves are placed together and wired. Such a bird home is shown in one of the illustrations ; and it has this advantage, that if a young bird dies, or the home becomes obstructed in any way beyond the remedying of the tenants, the Landlord may open it and rectify the trouble. A perch is provided just below the entrance by way of a front porch. A similar bird home is made by boring an auger hole from one end of a piece of limb to within a couple of inches of the other, plugging the bored end, and making an entrance hole near the other end.....A piece of the wooden tubing from a chain-pump, with ends plugged, and an entrance made in the side near the upper end, the tube being covered with bark, makes a very good substitute for a hollow limb. Even a long, narrow box, made up in about the same manner and covered with bark, answers very well. If old and weather stained boards are used, the bark covering is not absolutely necessary, but it adds to the attractiveness, from both the birds and the human standpoint.
>
> Another method of making artificial hollow limbs, which has been described, is to cut limbs of the proper diameter, according to the tenant for whom they are intended ; saw them in sections of proper length ; make an incision through the bark on one side from one end to the other, on the opposite side bore a hole through the bark for an entrance, then with a wooden wedge carefully separate the bark from the limb until it is entirely free. Sections of the limb an inch and-a-half in length are sawed off and nailed into the ends of the bark, and over the slit in the back a strip of branch or wood is nailed, which in turn is nailed to the tree or other support where this domicile is to rest. Small drainage holes to allow the water to escape from the bottom of any artificial nesting-limbs or boxes, in case rain should drive in, and sloping and projecting tops to shed rain,

NEST BOXES FOR BIRDS.

FIG. 6.

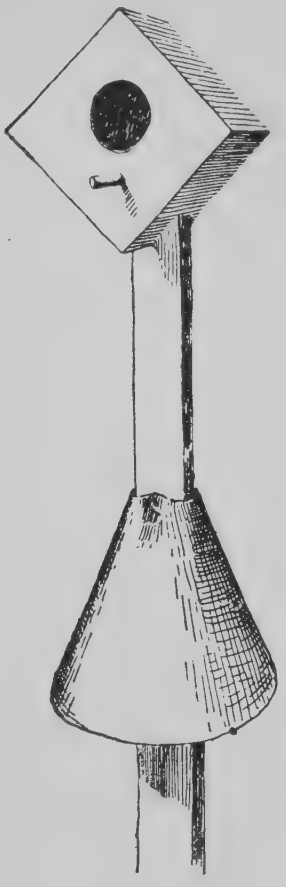

FIG. 7.

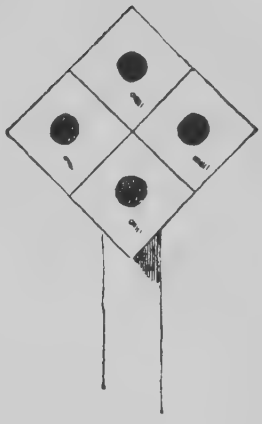

FIG. 8.

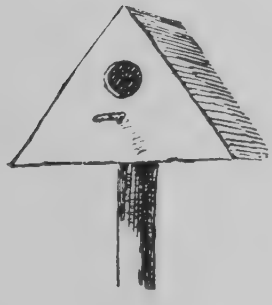

FIG. 9.

FIG. 10

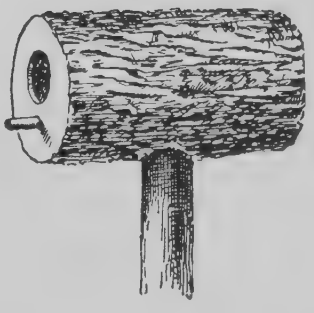

FIG. 11.

FIG 12.

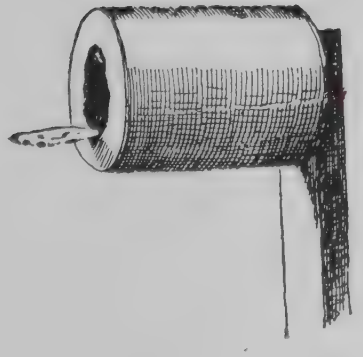

FIG. 13

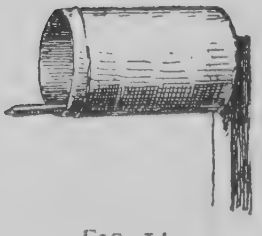

FIG. 14

SUGGESTIONS FOR BIRD BOXES.

are important in all cases. Pieces of limb, natural or artificial, may be wired to the trunk or branches of a shade tree, or fastened on top of a post, which may be covered with growing vines, but care must be taken to guard against the raid of cats and squirrels. A piece of tin fastened around the trunk of the tree or the post which bears the bird box, in the shape of an inverted funnel, is sometimes used to prevent cats gaining access to the nest, and when the box is on a post a strip of heavy square-mesh poultry-wire may be placed on the top of the post, under the box. On the grounds belonging to a neighbour of the writer, in a woodbine growing on a post, directly under the wire guard and box, a Song Sparrow built her nest and reared her brood.

Dried gourds, hollowed out, with an opening made for an entrance, hung in a tree, often attract Wrens and sometimes Bluebirds. In fact, Wrens will utilize old tin cans or almost any sort of receptacle. The writer saw one nest built in an old elbow of conductor-pipe that hung in an unused chicken-house, and another on the ashes in a barrel ash-sifter.

To utilize an old tomato-can, the flap which has been almost severed from the box in removing the fruit has a small hole cut out by making two slits about an inch apart and the same length, bending up the piece between the cuts. The rough edges around the entrance of any tin nesting receptacle should always be bent over to prevent birds being injured by them. Such a nesting box is either tacked to a piece of board, which is in turn fastened up on the side of a building or the trunk of a tree, or it may be fastened directly to the building or tree by two nails driven obliquely through the end from the sides. An old funnel, with the large end nailed against the side of a building or the trunk of a tree, makes another readily provided nesting place. Coffee-pots, tea-kettles, milk cans, lard-pails and flower pots are among the discarded utensils which may be fastened up in suitable places for the use of the birds as nesting sites."

The selection of a suitable position for the nest boxes is a question which must be governed by the nesting habits of the species it is desired to attract. Birds though extremely versatile in the selection of a nesting site instinctively follow nesting habits typical of their species. Certain species will commonly select the roofs and rafters and eaves of buildings, others use ledges, holes or crevices in the walls. Some nest on the ground and others only in trees or bushes, using either the trunk or the branches. The very height at which the nest is placed varies with different species ; The Scaly-bellied Wood Pecker (*G. squamatus*) is said to usually build its nest at a height 40 to 50′ from the ground, while the Black-naped species is said to be content with a much lower elevation. Certain Woodpeckers and Parroquets excavate holes for themselves, while others have no objection to adopting natural cavities either in the trunk or in the horizontal branches. The Coppersmith or Crimson-breasted Barbet *X. hematocephala* either nests in an old cavity or excavates a nest in a decayed branch ; the entrance to the nest is generally on the underside of the bough and the depth of the nest varies from one to four feet. With the Woodpeckers, certain species are said to have a preference for some particular kind of tree. The Himalayan Pied Woodpecker is said to prefer the Oak, the Scaly-bellied and Black-naped species favour the rhododendron ; while the Little Yellow Fronted Woodpecker (*L. mahrattensis*) which breeds throughout the Indian plains, shows no attachment to any particular tree, its nest being found in a dozen different kinds. Many species of birds are however not at all capricious as regards the height or the position of the nest. The Brown-backed Indian Robin builds at any height from 20 feet to the level of the ground. As regards a nesting site, the fork of a tree, the hollow of a broken stump, a hole in the trunk, in a wall, on the ground or in the thatch of a roof are all equally acceptable. It is recorded of one optimistic couple that they successfully reared a brood in the

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folds of a curtain hanging in a doorway, while another enterprising pair considered the pigeon hole of an office writing desk an eminently satisfactory site. The Black-backed Indian Robin (*T. fulicata*), found breeding in cantonments about houses, selects a hollow in the ground or a suitable hole in the wall or the roof of a house, a nest of this species has been taken in a lamp hanging under a porch. The Magpie Robin (*C. saularis*) usually prefers a hole in a tree but will also build in walls or under the caves of a hut. A common and interesting species that may perhaps be tempted into using the nest box is our Indian Hoopoe. The bird usually selects holes in stone walls, in the hollow of a tree, or the rafters of house as a nesting site. Perhaps the strangest nesting site on record is one which has been observed in connection with the Hoopoe. Pallas records that he found a nest of one of these birds in the thorax of a human carcase. Of our Indian Tits, the Common Grey Tit (*P. atriceps*) nests among out-houses and stables selecting a hole in a tree, wall or roof. A hollow bamboo projecting from a thatched roof has been repeatedly used by the bird. It is recorded that these birds often make use of the deserted nests of Barbets and Woodpeckers. While many species of birds that nest in buildings, etc., prefer deserted dwellings : there are others that seem preferably to select those that are inhabited ; an instance is found in the Common Swift. These birds, as is well known, build in colonies ; a common site is the rafters of a house ; or a verandah ; the nests are built in the crevices between the wall and the roof, while at times the nests are found attached to the roof itself.

There are two aspects to the practice of putting out nest boxes. The first concerns the bird lover whose object is to attract birds to his garden. The other is the scientific and undoubtedly the more interesting side of the question.

Intelligent observation of the nesting habits of birds will tend to increase our knowledge on this fascinating subject. Pycraft in his book " The History of Birds" says " It would seem that the " Field naturalist " as a general rule, for there are notable exceptions, finds more pleasure in nest ' robbing ' than in nest watching ; for though they have been assiduous in recording the number of eggs in a clutch, variation in colour and size, and in the choice of a nesting site the contributions towards our knowledge of the *brooding* habits of Birds are singularly few and incomplete." For the benefit of those who wish to avail themselves of the opportunity afforded I would suggest the numbering of all nest boxes. A dairy should be kept for each box showing how the inmates come to adopt the box ? What rivalry there was over occupation of the box ? How much time was spent over the nest building ? Did both sexes participate in the building of the nest ? At what periods were the eggs laid ? the length of incubation ? Was the work of incubation undertaken by both sexes ? With the great number of birds, incubation does not commence until the full complement of eggs have been laid but in some instances, as with some of the birds of preys incubation commences with the first egg laid so that the first nestlings help in the incubation of those that follow. Is the care of the young undertaken by the male alone or by the female alone or by both parents ? What is the nature of the food provided for the young ? It is believed that in the majority of birds the young are first fed on regurgitated food which is changed to insect food and finally either continues as insect food, in the case of insectivorous species, or changes to a vegetable diet with the grain and seed eating species.

A recent number of the journal contained an appeal by Dr. Ticehurst for nestlings of various species of birds. So far there has been very little response to this appeal. An opportunity would here be afforded for obtaining material which would be of help to Dr. Ticehurst in his important work.

The Society would be glad to receive from members accounts of any attempts made by them in putting up nest boxes, whether these have been successful or not.

NOTES ON THE GENERIC NAMES OF INDIAN THECLINÆ AND AMBLYPODIINÆ (*LEP. RHOP.*)

By

Capt. N. D. Riley, F.E.S., F.Z.S.

The following is a brief summary of notes made for my own guidance at various times, and may help to stabilise the nomenclature of this group of Indian Butterflies. It is only the older names that present any difficulty, the later authors having been more careful to fix the types of such generic names as they have proposed. I do not consider the fact that a generic name has been, for whatever length of time, employed in a wrong sense, is in any way a justification for its continued use in that sense. The sooner it is set right the better ; the future of Entomology is likely to be of greater duration than its past.

I have introduced a few names which, though not now applied to the groups in question, were formerly so applied, such as LYCÆNA, POLYOMMATUS, etc., about which there has been considerable argument in the past, and also a few generic names proposed by Tutt, with which one may in the future have to reckon.

For the sake of convenience I have arranged the genera alphabetically stating in each case what I consider is the type. This is solely from the point of view of nomenclature : whether the genera are entomologically valid or justifiable or not I have not tried to decide. *T. S.* after a specific name implies that that species is the type of the genus because it was designated such by the author of the genus at the time he proposed it : *S. S.* because it was the sole species referred to the genus by the author at the time he proposed it. In all other cases the reasons for designating any particular species as the type are given.

ACESINA,	Moore.	Journ. As. Soc. Beng. p. 41.	1884.	T. S.	*paraganesa*, de N.
AMBLYPODIA,	Horsf.	Cat. Lep. E. I. C. p. 98.	1829.		*paidanus*, Cramer.

Horsfield introduced the generic name *Amblypodia* for a number of species which he divided into five subsections, *viz.*, (1) *narada*, (2) *vivarna*, (3) *apidanus*, *centaurus*, *helus*, *eumolphus*, (4) *phocides*, (5) *vulcanus*, *lohita*, *syama*, *timoleon*, *jalindra*, *longinus*, *erylus*, *jangala*, *vidura*, *etolus*, representing in fact many genera.*

Doubleday (List Brit. Mus., p 23, 1847) employs it for a number of those species enumerated by Horsfield, and others.

Westwood (Gen. Diurn. Lep. p. 477, 1852), employs it in a similar sense, but also expressly states that "the types of the genus" are the large Indian *Amb. centaurus*, *apidanus*, *helus*, *anthelus*, etc., thus limiting the possible type of the genus to one of the first three of those species, since *anthelus* is not mentioned by Horsfield. The type was finally specified by Scudder (Hist. Gen. Butt. p. 108, 1875) as *apidanus*, which must be accepted.

It is unfortunate that, following Boisduval (1870), authors should consistently have ignored the earlier workers and taken *narada* as the type. Obviously, in view of Westwood's restriction, it could not be the type under any circumstances.

APHNÆOMORPHA,	deN.	Butt. Ind. III, p. 347.	1890.	T. S.	*orcas*, Drury.
APHNÆUS,	Hübner.	Verz. bek. Schmett. p. 81.	1822–3.		*orcas*, Drury.

Hübner gives only two species, *vulcanus* and *orcas*. No action was taken by any author in any way to affect the case till Scudder (Hist. Gen. Butt. p. 116, 1875) selected *orcas* as the type. This he was perfectly at liberty to do, and his

* He also states (p. 111 l. c.) that he considers "the species of the third section to be typical of the genus." See also Riley. Entom., 1922, p. 25.

action must be upheld. *Aphnœmorpha* must fall as an absolute synonym to *Aphnœus* in consequence.

APPORASA,	Moore.	Journ. As. Soc. Beng. p. 38.	1884.	S. S.	*atkinsoni*, Hew.
ARAOTES,	Doh.	Journ. As. Soc. Beng. p. 411, etc.	1889.	S. S.	*lapithis*, Moore.
ARHOPALA,	Boisd.	Voy. Astrol. p. 75.	1832.	S. S.	*helius* Cram. (*phryxus*, Boisd.)

Probably falls as a synonym to *Amblypodia* (q. v.)

ARTIPE,	Boisd.	Lep. Guat. p. 14.	1870.	T. S.	*eryx*, Linn. (*amyntor*, Herbst.)

Scudder (*l. c.* p. 121) states that the name must fall because it is preoccupied by *Artipus* (Schonh. Col. 1826). The similarity between the two names does not seem sufficiently close to warrant this, and I consider the name should be upheld, if it is required.

ARRHENOTHRIX,	deN.	Butt. Ind. III, p. 337.	1890.	T. S.	*penicilligera*, de N.
AUROTIS,	Dalm.	Vetensk, Akad. Handl. XXXVII, p. 63.	1816.		*betulæ*, Linn.

Although the type is not actually specified by Dalman it is most unmistakably indicated as *betulæ*. Falls to *Thecla* and *Zephyrus* (q. v.).

BASPA,	Moore.	Proc. Zool. Soc. Lond. p. 250.	1882.	S. S.	*melampus*, Cramer.
BIDASPA,	Moore.	Proc. Zool. Soc. Lond. p. 250.	1882.	T. S.	*nissa*, Koll.
BIDUANDA,	Dist.	Rhop. Malay. p. 237	1884.	T. S.	*thesmia*, Hew.
BINDAHARA,	Moore.	Lep. Ceylon, I. p. III.	1884.	S. S.	*phocides*, Fab.
BITHYS,	Hübner.	Zutr. Ex. Schmett. p. 18.	1818.	S. S.	*leucophæus*, Hubn.

In his Verz. bek. Schmett. p. 75 Hübner adds other species, and *gives a reference to his Zutrage for the description of leucophœus.* This shows p. 75 of the Verzeichniss appeared *after* p. 18 of the Zutrage ; in fact it does not seem to have been published till 1822-3.

BRITOMARTIS,	deN.	Journ. Bom. N. H. S. p. 305.	1896.	T. S.	*cleoboides* Elw. and deN.
BULLIS,	deN.	Journ. As. Soc. Beng. p. 559.	1897.	T. S.	*buto*, deN. (♂ nec. ♀)
CALLOPHRYS,	Billb.	Enum. Ins. p. 80.	1820.		*rubi*, Linn.

Billberg only mentions *vulcanus*, *rubi* and a MS species. *Rubi* was specified as the type by Scudder (l. c. p. 132).

As there seems to be some disagreement as to whether Billberg's list ' Enumeratio Insectorum in Museo Gust. Joh. Billberg' should be accepted or not, it may be as well to examine briefly the arguments for or against it.

Firstly it is said that it is merely a list of the specimens in the author's own collection. Certainly it is ; but the fact that the author, in the Rhopalocera alone, proposes over 40 new generic names is clear evidence that he did not intend it to be a ' mere list '. Further, he gives brief diagnostic characters for all the larger divisions down to groups of genera.

He does not give any generic diagnosis ; but the species (except the MS ones)

which he refers to his new genera are all at once recognisable from the localities and the authors' names which in all cases he gives. It has been said elsewhere (Wals. and Durr., E. M. M. p. 167, 1902) that " it is a concession to the older authors that we accept a named but undescribed genus if its types are recognisable ". This seems to be a case in point.

It is then further argued that we cannot be certain that Billberg correctly identified his species, and therefore we cannot accept his generic names, as we do not know whether the species he founded them on are the species he refers to. But this appears to be going a bit too far ; one must give him the benefit of the doubt at any rate. If we allowed this argument to stand Billberg is not the only author by a very long way whose work would have to be rejected.

CAMENA, Hew. III. Diurn. Lep. II, 1865. S. S. *ctesia*, Hew. p. 47.

The genus is, however, pre-occupied by CAMŒNA, Baly (Col. 1862), and must be dropped.

CATAPŒCILMA,	Butl.	Trans. Linn. Soc. Zool. p. 547.	1877.	S. S.	*elegans*, Druce.
CHÆTOPROCTA,	deN.	Butt. Ind. III, p. 311.	1890.	S. S.	*odata*, Hew.
CHARANA,	deN.	Butt. Ind. III. p. 401.	1890.	T. S.	*mandarinus*, Hew.
CHERITRA,	Moore.	Lep. Ceylon, p. 109.	1881.	T. S.	*freija*, Fab. (*jafra*).
CHERITRELLA,	deN.	Proc. Zool. Soc. Lond. p. 456.	1887.	S. S.	*truncipennis*, deN.
CHLIARIA,	Moore.	Journ. As. Soc. Beng. p. 32.	1884.	T. S.	*othona*, Hew.
CHRYSOPHANUS,	Hübn.	Zutrage Ex. Schmett. p. 24.	1818.	S. S.	*mopsus*, Hübn.

For some strange reason Hübner later (Verz. bek. Schmett. p. 72, 1822) removed *mopsus* from *Chrysophanus* to *Strymon* (q. v.) replacing it by a number of other species which he had not originally included in the genus at all.

CHRYSOPTERA, Zinck. Allg. Lit. Zeit. (Jena.) III, p. 75. 1817. *virgaureæ* Linn.

The name was proposed by Zincken for Ochsenheimer's ' family VIII (B) ' which was the coppers, etc. The type was specified by Tutt (Ent. Rec. XVIII, p. 131, 1906).

CIGARITIS,	Donz.	Ann. Ent. Soc. France, 2, V, p. 528.	1847.	S. S.	*zohra*, Donz.
COPHANTA,	Moore.	Journ. As. Soc. Beng. p. 35.	1884.	T. S.	*illurgis*, Hew.
COREANA,	Tutt.	Brit. Lep. IX, p. 276.	1908.	T. S.	*raphœlis*, Oberth.
CREON.	deN.	Journ. Bomb. N. H. S. p. 181.	1896.	T. S.	*cleobis*, Godt.
CREUSA,	deN.	Journ. Bomb. N. H. S. p. 176.	1896.	T. S.	*culta*, deN.
CUPIDO,	Schranck.	Fauna Boica, II, I, p. 153, 206,	1801.		*minima*, Fuess. (*alsus*).

The type was fixed by Kirby (Journ. Linn. Soc. Zool. X, p. 499, 1870) as, *minima*. As no action had been taken by any other author in the meantime, Kirby's action must be upheld.

CYANIRIODES, deN. Butt. Ind. III, p. 33 1890. S. S. *andersoni*, Moore.

DACALANA,	Moore.	Journ. As. Soc. Beng. p. 36.	1884.	T. S.	*vidura*, Horsf.
DARASANA,	Moore.	Journ. As. Soc. Beng. p. 42.	1884.	T. S.	*perimuta*, Moore.
DERAMAS,	Dist.	Ann. Mag. Nat. Hist. 5, XVII, p. 252.	1886.	S. S.	*livens*, Dist.
DEUDORIX,	Hew.	III. Diurn. Lep. I, p. 16.	1863.	T. S.	*epijarbas*, Moore.
DIPSAS,	Doubl.	List. Lep. B. M. p. 25.	1847.		*syla*, Koll. (*pholus*).

The genus as first used by Doubleday contained only two species, both MS. It was adopted and described by Westwood (Gen. Diurn. Lep. II, p. 479, 1847) who also specified as the type *syla*, Koll. of which the MS. species *pholus* Doubl. is given as a synonym.

The name must however be dropped being pre-occupied in Reptiles (Lam., 1768) and Molluscs (Leach, 1814).

DRINA,	deN.	Butt. Ind. III, p. 442.	1890.	T. S.	*donina*, Hew.
DRUPADIA,	Moore.	Journ. As. Soc. Beng. p. 31.	1884.	T. S.	*ravindra*, Horsf.
EOOXYLIDES,	deN.	Butt. Ind. III, p. 432.	1890.	T. S.	*tharis*, Hübn.
EUASPA,	Moore.	Journ. As. Soc. Ben Beng. p. 29.	1884.	S. S.	*milionia*, Hew.
FLOS,	Doh.	Journ. As. Soc. Beng. p. 412, 423,	1889.	T. S.	*apidanus*, Cram.

Falls to *Amblypodia*, of which it is an absolute synonym.

HELIOPHORUS,	Geyer.	Hübner's Zutrage IV, p. 40.	1832.	S. S.	*epicles*, Godt.

Geyer gives only *helenus*, which is a synonym of *epicles*.

HEODES,	Dalm.	Vetensk, Akad. Handl. XXXVII, p. 63, 91.	1816.		*virgaureæ*, Linn.

The name is proposed by Dalman as a subgenus of his own *Zephyrus*. At p. 91 he enumerates seven species without specifying any type, but previously on p. 63 in a generic synopsis he clearly indicated that he considered *virgaureæ* a typical species. This should therefore be taken as the type, as stated by Tutt (Brit. Lep. VIII, p. 313), in spite of Scudder's ill-advised action (l. c. p. 187) in suggesting *phlæas* as the type.

HESPERIA,	Fab.	Ent. Syst. III (1), p. 258.	1793.		*malvæ*, Linn.

Fabricius originally included in this genus some 350 species, including both *Lycænidæ* and *Hesperidæ*, among them *malvæ*. The type was fixed by Cuvier (Table Element, p. 592, 1798), who gives a diagnosis of the genus and cites *malvæ* as the only example.

HORAGA,	Moore.	Lep. Ceylon, I. p. 98	1881.	T. S.	*onyx*, Moore.
HYPOCHRYSOPS,	Feld.	Reise Nov. p. 251.	1865.		*anacletus*, Feld.

Felder included a number of species in the genus originally. The type was fixed by Scudder (l. c. p. 194) as *anacletus*.

HYPOLYCÆNA,	Feld.	Wien. Ent. Monats. p. 293.	1862.		*tharrytas*, Feld.

Scudder specifies *sipylus* as the type, regarding *sipylus* and *tharrytas* as the same species. This seems doubtful. Since Felder does not mention *sipylus* in

his original description of the genus, *tharrytas* should be taken as the type.

HYSUDRA, Moore. Proc. Zool. Soc. Lond. p. 250. 1882. S. S. *selira*, Moore.

ILERDA, Doubl. List Lep. B. M. II, p. 25. 1847. S. S. *epicles*, Godt.

Doubleday does actually mention some other species, but, as he only gives them MS names, they must be disregarded.

Falls to *Heliophorus*, of which it is an absolute synonym.

INDOXYLIDES, Doh. Journ. As. Soc. Beng. p. 410. 1889. (nom. nud.)

Doherty states that the name was proposed by him for *Eooxylides* (which, incidentally, was not published till the following year by déNiceville), but he gives no types nor description and himself sinks it to *Eooxylides*. Doherty's proposal of the name *Indoxylides* appears to have been contained in, and confined to a letter to déNiceville. The name must be regarded as an absolute synonym of *Eooxylides*.

IOIS, Doh. Journ. As. Soc. Beng. p. 411. 1889. (nom. nud.)

The only species mentioned by Doherty in connection with this name is " an *Arhopala*, apparently *inornata*, Felder ", and then follow some few words about the egg. This is altogether insufficient to establish *Iois* as a valid generic name ; it should be treated as a synonym, of *Amblypodia*.

IOLAUS, Hübn. Verz. bek. Schmett. p. 81. 1822-3 S. S. *eurisus*, Cram.

Hübner also gives *helius*, Fab., which is a synonym of *eurisus*.

IRAOTA, Moore. Lep. Ceylon p. 101, 1881. S. S. *timoleon*, Stoll (*mæcenas*, Fab.)

JACOONA, Dist. Rhop. Malay. p. 233 1884. T. S. *anasuja*, Feld.

JALMENUS, Hübn. Zutr. Ex. Schmett. p. 29. 1818. S. S. *evagoras*, Don.

Later (Verz. bek. Schmett. p. 75, 1822-3) Hübner added *venulius* and gave a reference to his earlier use of *Jalmenus* in the Zutrage.

JAPONICA, Tutt. Brit. Lep. IX, p. 277 1908. T. S. *sæpestriata*, Hew.

LEHERA, Moore. Proc. Zool. Soc. Lond. p. 528. 1883. T. S. *eryx*, Linn.

Falls to *Artipe* (q. v.).

LICUS, Hübn. Zutr. Ex. Schmett. 2nd hundred, p. 7. 1822. S. S. *niphon*, Hübn.

The name is pre-occupied in Coleoptera (Fab. 1787).

LISTERIA deN. Journ. As. Soc. Beng. p. 35. 1894. T. S. *dudgeoni*, deN.

LOXURA, Horsf. Cat. Lep. E. I. C. p. 119. 1829. *atymnus*, Cram.

L. atymnus and *pita* are given. From the context the former was obviously considered by Horsfield the more typical, and has been accepted as the type, quite correctly.

LYCUS, Hübn. Verz. bek. Schmett. p. 74. 1822-3

A misspelling for *Licus*, Hübner, q. v.

MAHATHALA, Moore. Proc. Zool. Soc. Lond. p. 703 1878. S. S. *ameria*, Hew.

MANECA,	deN.	Butt. Ind. III, p. 344.	1890.	T. S.	*bhotea*, Moore.
MANTO,	deN.	Journ. Bomb. N. H. S. p. 312.	1895.	T. S.	*hypoleuca*, Hew.
MARMESSUS,	Hübn.	Verz. bek. Schmett. p. 81.	1822-3		*lisias*, Fab.

Four names were given by Hübner under *Marmessus*, *alcides*, *corax*, *atymnus* and *lisias*. The type was specified by Scudder (l. c. p. 212) as *lisias*. This he was perfectly free to do as no author had taken any action in any way to affect the case. DéNiceville appears to have been aware of this but failed to adopt it.

MARSHALLIA,	Doh.	Journ. As. Soc. Beng. p. 410.	1889.		(nom. nud)

No description is given by Doherty, nor does he attribute any species to the genus. He states that he proposed the name (? in litt.) for *Eooxylides* (deNiceville 1890) but that it was pre-occupied (Spongida ; Zittel, 1877).

The name must be regarded as an absolute synonym of *Eooxylides*.

MASSACA,	Dob.	Journ. As. Soc. Beng. p. 411, 417 429.	1889.	T. S.	*pediade*, Hew.
MOTA,	deN.	Butt. Ind. III, p. 345.	1890.	T. S.	*massyla*, Hew.
MYRINA,	Hübn.	Illiger's Mag. VI, p. 286.	1807.		*silenus*, Fab. (*alcides*, Cr.).

Hübner only mentioned two species, *silenus* and *helius*. The type was fixed by Oken in 1815 (Lehrb. d. Naturg. I, p. 722) who used the name for eight species, only specifying two by name, one of which was *silenus*. This was confirmed by the action of Westwood (1852) and Kirby (1870), the latter specifying *silenus* as the type.

NADISEPA,	Moore.	Proc. Zool. Soc. Lond. p. 249.	1882.	S. S.	*jarbas*, Fab.
NARATHURA,	Moore.	Proc. Zool. Soc. Lond. p. 835.	1878.	T. S.	*hypomeuta*, Hew.
NEOCHERITRA,	Dist.	Rhop. Malay. p. 252	1885.	S. S.	*amrita*, Feld.
NEOLYCÆNA,	deN.	Butt. Ind. III, p. 65	1890.	T. S.	*sinensis*, Alph.
NEOMYRINA,	Dist.	Rhop. Malay. p. 234	1885.	T. S.	*himcalis*, G. & S.
NILASERA,	Moore.	Lep. Ceylon I, p. 114.	1881.	T. S.	*centaurus*, Fab.
OPS,	deN.	Journ. Bomb. N. H. S. p. 296.	1895.	T. S.	*ogyges*, deN.
OXYLIDES,	Hübn.	Verz. bek. Schmett. p. 77.	1822-3		*faunus*, Drury.

Hübner set up the genus for *celmus* and *faunus*. The type was specified by Scudder (*l. c.* p. 234) as *faunus*.

PANCHALA,	Moore.	Proc. Zool. Soc. Lond. p. 251.	1882.	T. S.	*ganesa*, Moore.
POLYOMMATUS,	Latr.	Nouv. Dict. d'Hist. Nat. XXIV, p. 184, 200.	1804.	S. S.	*icarus*, Rott, (*argus*).
PRATAPA,	Moore.	Lep. Ceylon, I, p. 108.	1881.	T. S.	*deva*, Moore.

PSEUDOCHLIARIA,	Tytler.	Journ. Bomb. N. H. S. p. 139,	1915.	T. S.	*virgoides*, Tyt.
PSEUDOLYCÆNA,	Wallgn.	K. Vett. Akad. Vorh. XV, p. 80.	1858.	T. S.	*marsyas*, Linn.
PSEUDOMYRINA,	H. H.	Druce. Proc. Zool. Soc. Lond. p. 606.	1895.	T. S.	*martina*, Hew.
PURLISA,	Dist.	Rhop. Malay. p. 234	1884.	T. S.	*giganteus*, Dist.
RAPALA,	Moore.	Lep. Ceylon, I, p. 105.	1881.	T. S.	*varuna*, Horsf.
RATHINDA,	Moore.	Lep. Ceylon. I, p. 99	1881.	T. S.	*amor*, Fab.
REMELANA,	Moore.	Journ. As. Soc. Beng. p. 37.	1884.	T. S.	*jangala*, Horsf.
RITRA,	deN.	Butt. Ind. III, p. 411.	1890.	T. S.	*aurea*, Druce.
RUMICIA,	Tutt.	Ent. Rec. XVIII, p. 131.	1906.	T. S.	*phlæas*, Linn.
RURALIS,	Tutt.	Ent. Rec. XVII, p. 212, 1905; XVIII, p. 130, 132, 1906; Brit. Lep. VIII, p. 313.	1906.	T. S.	*betulae*, Linn.

Tutt brings forward this Linnæan name stating that it was "heterotypical in its use by Linnæus" but that Barbut in Les Genres des Insectes de Linné (1781) "specifies *betulæ* as the type".

Actually all Barbut did was to give one example of each of the Linnæan divisions of *Papilio*, describing it and figuring it, but always referring to it in the full quadrinomial system of Linnæus. When dealing with *betulæ* he calls it *P. P. Ruralis betulæ*, and it comes immediately under the heading PLEBEII. This cannot be considered as a binomial application of the word *Ruralis*, and hence Barbut's application of the name can no more be accepted as justification for its employment as a valid generic name from that date than can Linnæus'own use of the term. If *Ruralis* is to be accepted as a valid generic name on the strength of Barbut's action, then *Candidus*, *Phaleratus*, etc., must also be accepted, as they were considered of equal rank as subdivisions of *Papillo* in the early days. The only sane course with these names appears to be to neglect them entirely until someone employs them in accordance with the strict rules of binomial nomenclature.

Ruralis should therefore be attributed to Tutt, who first uses it binomially, the type being specified by him as *betulæ*. The name therefore falls to *Thecla* and *Zephyrus* (q. v.)

SATADRA,	Moore.	Journ. As. Soc. Beng. p. 38.	1884.	T. S.	*atrax*, Hew.
SATSUMA,	Murray.	Ent. Mo. Mag. XI, p. 168,	1874.	T. S.	*ferrea*, Butler.
SEMANGA,	Dist.	Rhop. Malay. p. 233	1884.	T. S.	*superba*, Druce.
SINTHUSA,	Moore.	Journ. As. Soc. Beng. p. 33.	1884.	T. S.	*nasaka*, Horsf.
SITHON,	Hübner.	Verz. bek. Schmett. p. 77.	1818.		*nedymond*, Cram.

The name was employedby Hübner for *nedymond* and *melampus*. The type was virtually fixed by Kirby (Syn. Cat. p. 411, 1871) as the former species, which was specified by Scudder (*l.c.* p. 269) as the type.

SPINDASIS,	Wallgn.	Rhop. Caffr. p. 45.	1857.	S. S.	*natalensis*, Dbl. & Hew. (*masilikasi*).
STRYMON,	Hübner.	Zutrage Ex. Schmett p. 22.	1818.	S. S.	*melinus*, Hübn.

The date of Hübner's use of the name in his Verz. bek. Schmett, p. 74, is apparently much later, about 1822-3.

SUASA,	deN.	Butt. Ind. III, p. 386.	1890.	T. S.	*lisides*, Hew.
SURENDRA,	Moore.	Proc. Zool. Soc. Lond. p. 835.	1878.	S. S.	*quercetorum*, Moore.
TAJURIA,	Moore.	Lep. Ceylon, I, p. 108.	1881.	T. S.	*cippus*, Fab. (*longinus*).
THADUKA,	Moore.	Proc. Zool. Soc. Lond. p. 836.	1878.	S. S.	*multicaudata*, Moore.
THAMALA,	Moore.	Proc. Zool. Soc. Lond. p. 834.	1878.	S. S.	*miniata*, Moore.
THECLA,	Fab.	Illiger's Mag. VI, p. 286.	1807.		*betulæ*, Linn.

Fabricius set up the genus for *betulæ*, *spini* and *quercus*. Swainson (Zool. Ill. I, 2, p. 69, 1821-2) specified *betulæ* as the type. This action was perfectly consistent with the treatment of the genus by previous authors and was confirmed by the action of Curtis (1829) and Westwood (1840),Scudder (*l. c.* p. 280) specified *spini* as the type, labouring under the fallacy that because *Zephyrus* had been set up by Dalman in 1816 with *betulæ* as the type, that species was no longer available. This fallacy runs throughout, and sadly spoils his otherwise excellent work on the Genera of Butterflies. *Betulæ* must be taken as the type.

TICHERRA,	DeN.	Proc. Zool. Soc. Lond. p. 457.	1887.	T. S.	*acte*, Moore.
USSURIANA,	Tutt.	Brit. Lep. IX, p. 276.	1908.	T. S.	*michœlis*, Oberth.
UTICA,	Hew.	Ill. Diurn. Lep. p. 56.	1865.	S. S.	*onycha*, Hew.

Unfortunately pre-occupied in Crustacea, 1847.

VADEBRA,	Moore.	Proc. Zool. Soc. Lond. p. 528.	1883.	T. S.	*petosiris*, Hew.
VIRACHOLA,	Moore.	Lep. Ceylon, I, p. 104.	1881.	T. S.	*perse*, Hew.
YASODA,	Doh.	Journ. As. Soc. Beng. p. 410.	1889.		*pita*, Horsf.

Doherty did not refer any species to the genus although he gave a brief diagnosis of it. Dé Niceville adopted it from Doherty in his Butterflies of India, III, p. 438 (1890) and specified *pita* as the type.

ZELTUS,	deN.	Butt. Ind. III, p. 399.	1890.	T. S.	*etolus*, Fab.
ZEPHYRIUS,	Billb.	Enum. Ins. p. 80.	1820.		

A misspelling of *Zephyrus*, of which it is an absolute synonym.

ZEPHYRUS,	Dalman.	Vetensk. Akad. Handl. XXXVII, p. 62.	1816.	T. S.	*betulæ*, Linn.

ZESIUS,	Hübner. Verz. bek. Schmett. 1818. p. 77.		*chrysomallus*, Hübn.

Hübner put *phœomallus* and *chrysomallus* in the genus originally. The latter was specified as the type by Scudder (*l. c.* p. 292).

ZINASPA,	deN.	Butt. Ind. III, p. 451.	1890.	*todara*, Moore.

Erected by de Niceville for *todara* and *distorta*. These are generally considered to be forms of the same species, *todara* is specified as the type by Swinhoe (Lep. Indica, IX, p. 74, 1911).

NOTES ON MESOPOTAMIAN MAMMALS

By

Capt. C. R. S. Pitman, d.s.o., m.c., m.b.o.u.

Having read the report on the Mammals of Mesopotamia in Journal Vol. XXVII, No. 2, I have realised that I have a good many Field Notes on the Mammals of that country, which may be of some value, as I served there from January 1916 until April 1918. I was principally on the Tigris, from Basra to Daur (15 miles upstream of Samarra), with a brief interval on the Euphrates at Feluja and the Hindiyeh Barrage from the middle of March 1917 until the middle of July that year.

Pachyura etrusca—*Pigmy Shrew*—All the records mentioned are from the Tigris. The only one I came across was at the end of March 1917 when my Regiment had just arrived at Feluja on the Euphrates. One afternoon while we were sitting in the Mess Tent, which had been dug down into the ground, a minute shrew with body no bigger than that of a bumble bee, suddenly appeared on the table, and was running about for several minutes; and although once actually imprisoned under an inverted tumbler by one of my brother officers, I failed to secure it as a specimen.

Hemiechinus auritus—*Long-eared Hedgehog.*—Again I note that all the specimens recorded are from the Tigris, though Ludlow recorded this species as plentiful at Hit, R. Euphrates. Most of my acquaintance with these animals was at Feluja on the banks of the Euphrates during March and April 1917, when I found them very common.

I kept alive all the specimens that were brought to me and for their prison dug a pit into the stiff soil, which measured 5 feet in diameter and had vertical sides nearly 4 feet in height.

At the bottom of this pit the various Hedgehog inhabitants excavated burrows on the same level as the bottom, but which had a tendency to turn upwards.

However none of the little prisoners ever escaped by digging right up to the surface, and in fact never even got as far as anywhere near it.

A pair were my first capture and they soon dug themselves in, once they were placed in the pit; the usual length of burrows they excavated was 2 to 3 feet.

I then obtained 4 youngsters a fortnight old, which apparently cried so much their first night in the pit, that two more adults, who may have been the parents, were attracted by the noise and fell in. Those youngsters never managed to dig more than a few inches into the ground. At night they were all very active and I used to watch their antics and see them feed, with the aid of an electric torch which did not seem to frighten them in the least. I fed them on bread and watered milk, raw potatoes, carrots, cucumber and other vegetables, as well as dried gram, lentils, dhal and crushed barley.

With the exception of one of the youngsters which died, they all flourished and soon became quite tame, though they kept to their burrows during the day.

I eventually let them all go, as there was a difficulty of making up and storing the skins.

As all my notes are not handy at the present moment, I cannot say where else I came across this species in Mesopotamia, although I know that I have other records which include the note of a drowned specimen found near Samarra in February 1918.

Felis chaus—*Jungle Cat.*—One day in January 1916, shortly after my arrival in Mesopotamia and while on the march up the Tigris between Kurna and Ezra's Tomb, I came across one of these animals, while out small game shooting, in thick cover on the river bank in the late afternoon.

Some of my scouts told me that a Jackal was crouching in a bush and that they would catch it for me.

This they proceeded to do and after a short though fierce struggle, they emerged scratched but triumphant with the biggest and most hideous type of wild cat I have ever seen. It really was a magnificent creature, considerably larger than a Jackal and standing as it did a deal higher. In colour it was a pale, though bright brownish orange or ginger, with rich reddish brown and chestnut stripes. The beast was well secured with cloths and straps, and I had intended trying to keep it alive, but unfortunately it escaped on the way back to camp. I subsequently saw other though much smaller specimens whilst shooting in the thick cover on the banks of the Tigris and R. Adhaim at various points as far North as Daur, but failed to secure any specimens.

From March to July 1917, while on the Euphrates at Feluja and the Hindiyeh Barrage, I did not come across this species but the country that I traversed in those parts was not suitable, and thick cover was rarely visited as it was the close season for small game shooting.

In early March 1917, while shooting Hares and Black Partridge in scrub cover on the Tigris banks between Kut and Baghdad I saw a smaller type of wild cat, a greyish buff in colour and spotted blackish, at which I could not get a shot.

HERPESTES PERSICUS—*The Persian Mongoose*—Noted principally in the Palm Groves in the vicinity of the cities of Busra, Amarah, and Baghdad on the Tigris. No specimens were secured and no type of ICHNEUMON ever noted. Without my notes I cannot for certain say whether I have many records of the Mongoose, from the Euphrates, but there were a lot in scrub by a palm grove near the Hindiyeh barrage, where I found a clutch of Marbled duck's eggs they had consumed.

HYÆNA HYÆNA—*The Striped Hyæna.*—When at Feluja on the R. Euphrates in March, April and May 1917, I knew of the same collection of Hyæna Earths which Ludlow mentions. They were situated a few miles north of the town in a group of low marl and gypsm mounds not very far from the river, and which actually formed a portion of the ruins of the ancient Persian fortress of Anbar, but I never came across the owner. In the broken country near the Tigris, where it is joined by the Shatt-el-Adhaim, this hyæna was quite common during October and November 1917, and on more than one occasion they were caught in the open by our pig-sticking enthusiasts and hunted for miles, but they were practically impossible to overtake even in the open country.

I often saw them out on the elevated plain above the river soon after dawn and watched them return to the broken ground, and during some manœuvres one day we put one up in broken country as late as 11-0 in the morning. In this same area a sepoy who went off his head and wandered out into the desert and shot himself, was eaten by hyænas, who just left the skull and a few bones.

Some of our advanced posts in the broken and elevated country on either side of the Adhaim were much worried nightly by these beasts who stole many a live sheep and, though shot at, always got away unscathed with their prey.

While in camp at Bait-al-khalifa from November 1917 till March 1918, traces of hyæna were to be found everywhere in the broken country, ancient ruins and in the steep banks of the huge and ancient Nahrwan Canal, from the R. Adhaim to Daur which was as far North as I ever went. Reports of these being seen on both banks of the Tigris in those parts by reliable observers were quite frequent, though I never actually saw any myself.

CANIS AUREUS—*The Jackal.*—There is little for me to say about this species which I found exceedingly common both on the Tigris and Euphrates, wherever I happened to be in camp from 1916 to 1918. I have no special notes on their habits, except that I found them breeding freely in holes and mounds along the banks of the Magasis and other canals just down stream of Kut-el-Amarah, on the right bank of the Tigris during June 1916, when numerous litters of 5 or 6 cubs had just been born and the camps were full of youngsters kept by the

men as pets. Any scrub cover near the rivers and marshes, as well as the gardens and cover in the vicinity of towns simply swarmed with jackals.

VULPES PERSICA—*Persian Desert Fox.*—A very attractive and elegant little creature, that I was always attempting to bring to bag, though I but rarely succeeded. It seemed quite common wherever there were mounds, ancient tumuli and canal banks, etc., and was found to be very plentiful in broken country which was really suitable, such as in the vicinity of the Shatt-el-Adhaim. Being nocturnal in habits one rarely saw them except in the early morning or just before dark, though I have frequently caught them sunning themselves just outside their earths during the middle of the day. Whereas the jackal often had no alternative bolt holes, this species usually provides itself with one or more. The best way to secure specimens was to lie up over an earth in the evening and wait for them to emerge or try and catch the night reveller on his homeward journey in the early morning and even then unless shot at close quarters they frequently got in to their earths before dying.

LUTRA LUTRA—*Common Otter.*—This was an animal that I was particularly anxious to secure in Mesopotamia, but I never even saw one, though I came across their traces in the Tigris near the R. Adhaim in September, October, 1917, and in the Euphrates and marshes in the vicinity of the Hindiyeh Barrage during June and July of the same year.

JACULUS LOFTUSI—*Loftus Jerboa.*—During June and July 1916 I found this species very common indeed on the bare " pat " plains near SHEIKH SAAD on the Tigris, where we had one camp. Absolutely nocturnal in habits, they puzzled our dogs tremendously and I never saw them get caught by a dog—in fact I have frequently seen these little Jerboas leap right over their canine pursuers. Their earths go steeply into the ground for 2 or 3 feet and the little creatures evidently lie up all day in the cool, damp earth as I always noticed that captive specimens, of which we tried to keep many from time to time, suffered tremendously from the great heat during the day, even when kept in the coolest of places dug right into the grounds, so much so that we never managed to keep any alive for more than a few days. They used to eat a certain amount of grain and crushed barley. They stopped the mouths of their earths by day and came out at dusk. Occupied earths during the day were easily distinguishable by the numerous foot prints made the previous night and one only had to pour a little water down the hole to flood out the owner, who was at once bagged on appearing outside his earth. To see dozens of white tail tips moving about jerkily in the dusk was really quite uncanny.

I also came across them less plentifully on the Euphrates at Feluja (March-April —May 1917), Euphrates Barrage (June-July 1917), near Baghdad (August-September 1917) and near R. Adhaim (September-October 1917). I believe this species hibernates to a great extent during the winter months and heavy rains but do not know whether they seal up the entrances of their burrows to keep out the torrential rains.

N.B.—After writing my notes about JACULUS LOFTUSI, I re-read the B. N. H. S. Journal's introductory note and find that Mesopotamian specimens had only been taken on the Euphrates side. The animals to which I refer are the " Jumping Jerboas " and which I made no mistake about in each instance.

TATERA BAILWARDI—*Bailward's Gerbil.*—There is little that I know of this species except that they were common in a colony in damp ground at the edge of L. Akkarkuf near Baghdad in July-August-September 1917. I used to catch them by flooding out their holes, but it was not too easy and I think their burrows go fairly deep and long, also as far as I can remember these earths did not have the entrances stopped with earth as in the case of *Nesokia* and *Jaculus*, but here I am open to correction. They used to come out in daylight both in the early morning and evenings and travelled over a good deal of ground

during the night. I used to shoot them with a ·22 bore when they came out of an evening.

NESOKIA BUXTONI—*Buxton's Mole Rat.*—I have little to add to Buxton's remarks, all of which apply to my own experience of these animals. My specimens were secured out of a colony who had their burrows on the foreshore of L. Akkalkuf-Baghdad. I frequently saw them excavating during the day in July and August, and used to shoot specimens with a ·22 bore in the evening when they came half out of their burrows in the broad daylight, after I had removed the loose earth from the entrances.

MUS GENTILIS—*House Mouse.*—Swarmed everywhere and in the vicinity of camps and supply dumps multiplied exceedingly and very swiftly. Undoubtedly there were plenty present in the country originally, in the vicinity of towns and Arab villages, but I am certain that any quantity were introduced amongst the grain sacks and fodder, as well as the wooden cases of provisions, which were a part of the army's supplies. It was quite extraordinary the way in which a camp or supply dump would be formed in the barren desert, and within a week the place would be swarming with mice, as well as with large flocks of *Passer domesticus.* I shot many in my dug-out tent in various camps, but never kept any of the skins or skulls.

ACANTHION (Sp.)—*Porcupine.*—I found this animal quite common in the broken country on either side of the Shatt-el-Adhaim during September-October and November 1917, but being entirely nocturnal I could never secure a specimen, as the earths were a long way in front of our night picquet line, and also were driven into the sides of rocky mounds and the base of cliffs, and in consequence were quite impossible to dig out. In November and December of that year and in January and February 1918, I came across numerous earths in the ancient ruins and steep banks of old canals all along the Tigris from the Adhaim to Daur (15 miles North of Samarra) and there were at least half-a-dozen earths in the vicinity of our camp at Bait-al-Khalifa. All but one of these were quite impossible to dig into and sitting up and waiting for the inhabitants to emerge on the bitterly cold nights of the Samarra winter did not attract me, especially as one could not have been certain of getting a shot as the animals did not come out every night.

However, I did try and dig out an earth which went deep into the ground amongst hard stony ruins and lumps of gypsum and after two days hard work captured the owners who were rather badly mauled in the process. I have already described, in a recent number of B. N. H. S. Journal, the method by which one of these captured, and no doubt terrified, beasts gave me an extraordinarily powerful blow on the leg. The ♀ which was the bigger of the pair weighed 25 lbs. and the ♂ 23 lbs., these weights being taken as they lay directly after they had been killed. We eat them both and they were excellent. In the Adhaim area they used to come down and drink in the pools left in the otherwise dry bed of the river; near BAIT-AL-KHALIFA there was no water at all available for them, except the nightly dew or when rain fell. From my observations it appeared that these animals partially hibernate during the winter and most certainly do not leave their burrows every night. There are usually several entrances to one burrow, but as they are all quite close to each other, they can hardly be regarded as bolt holes such as are usually utilized by Foxes.

LEPUS DAYANUS CONNORI—*Connor's Hare*—I found this species very common wherever there was dry cover all along the Tigris as far North as Daur and on the Euphrates from Feluja to Hit, the only area in which I served on the latter river. They provided excellent sport if one had a gun and many were brought to bag during January 1916 when my Regiment was marching up the Tigris to the Kut relief operations.

A close season was eventually instituted and I think these animals were pro-

tected from March till end of August. I came across young ones in April as well as in July. The following bags may be interesting :—

3-12-16	.. Near Kut el-Amarah	.. 2
10-11-13-1-17	.. do.	.. 4
19-20-24-2-17	.. do.	.. 6
4-3-17	.. Near Aziziyeh (R. Tigris)	.. 5
2-3-7-17	.. Euphrates Barrage (Shot as N. H. Specimens)	.. 5
27-30-9-17	.. Shatr-el-Adhaim	.. 3
6-7-10-16-10-17	.. do.	.. 4

On 4th February 1918 near Samarra while on the march 3 hares broke through our column and a sepoy killed one with the butt of his rifle. This specimen I sent the B. N. H. S. and at the time I noted that it was very rufous on the flanks and had fine thick fur.

It was a very common occurrence when on the line of march for the protecting troops on the flanks to put up numerous hares which invariably became completely bewildered and charged through the marching column. I frequently noticed that when hares ran off across the open plain, they always lay up in the first piece of cover, however small, or in a small ditch, nullah or broken piece of ground where they could be at once followed up and brought to bag. Often one tiny patch of open scrubby cover near the river would contain the best part of a dozen hares. In very thick cover they were scarce.

FELIS CARACAL.—*The Caracal.*—I never saw any species of this animal in Mesopotamia, but while in camp at Bait-al-khalifa, Samarra—a bit of a naturalist amongst our Cis-frontier Pathans described an animal to me which fitted in with the description of a Lynx or CARACAL, and which he said lived in a den leading off a deep hole amongst the ruins, and he used to sit up by night and try and shoot it. An animal of sorts did live there, but I am quite sure it was not a Caracal, as the only food supply near by was one covey of see-see.

The only Caracal I shot in India was on the Indus near Dera Ismail Khan. It was put up in thick cover where small game was abundant.

GAZELLA MARICA.—*The Marica Gazelle.*—As far as I can remember, not having my complete diaries handy, I first of all came across a Gazelle in Mesopotamia in the area between Baghdad on the Tigris and Feluja on the Euphrates, in the middle of March 1917, but as I never secured any specimens I can offer no remarks on their size, markings, or type of horns. Gazelle were also very plentiful near Feluja, but west of the Euphrates, and evidently dropped their young during April and early May, at which season the Arabs used to bring dozens round our camps to sell to the troops as pets. As far as I could make out, single youngsters were just as common as pairs. Out of a couple of dozen that I tried to bring up with the aid of goats only two survived for any length of time, and in fact I don't think more than half-a-dozen was successfully reared in the whole brigade.

A large number died because they were brought in too young, and we eventually discovered that the only hope of saving the youngsters was to turn them loose with the foster mother and leave them to look after themselves entirely. They began to graze very soon after they were born and quickly became exceedingly tame. They strayed far when feeding, but a whistle would bring them galloping and bounding in at once. To me, what was a most extraordinary thing, was the way the little beggars swim. Two, that a Subadar of mine had successfully reared, were out grazing near one of our posts which protected a bridge over a large irrigation canal. The two Gazelle, who were then possibly 6 weeks' old, were feeding on the other side of the canal, which had steep banks over 30 feet high, with a perpendicular drop of a few feet at the bottom and was 40 to 50 feet wide and about 10 feet deep. The Subadar whistled, and the little beggars unhesitatingly plunged into the stream and swam across swiftly with the greatest of ease ! I was absolutely amazed at the performance. The little buck died of some disease in the head or perhaps from some animals getting into the brain

through the ears, when he was 2 months' old, but I saved the doe, who became very tame and made a charming pet, until she eventually died in Palestine in October 1918, after I had her nearly 18 months. They grazed freely on almost all desert grasses and herbage, this being their staple food, but they also liked crushed barley, gram and dhall, as well as dried fruits, dates and sugar. Both when young and full grown they uttered a peculiar gutteral grunt, like a very bass and throaty " ba-a " but clipped short. The Arabs told me that the does always came in from the desert to drop their young in the cover and seclusion of the spring crops near the river, and that was why they caught such large quantities of the youngsters.

The young become very fleet of foot within a few days of being born, and then are almost impossible to catch. In February 1918 when my doe was nearly a year old, she was chased the best part of 10 miles out of camp by a couple of Suigis (Persian Grey hounds). This was at 2-30 in the afternoon ; and at 7-30 the next morning she returned furtively to the camp, found my tiny tent and tucked herself away in a corner under the bed for the rest of the day ! Once when I had been away for some weeks and returned to my company, her joy was so great that she nearly choked herself in her anxiety to get to me, for in those days, to prevent her wandering too far, I had her tied to her foster mother goat by a 20 feet piece of rope. This Gazelle was very attached to her foster mother and never left her up till the time she died, which I believe was due to influenza, as it was during the great epidemic of October 1918. Curiously enough the foster mother died a few weeks later.

GAZELLA—Sp.—The first comment I wish to make on the B.N.H.S. Journal's notes is that all the masks came from Samarra so that the 6 labelled Mesopotamia should really read Samarra, and their dates 15th and 20th January 1918. They were probably indifferently labelled by me and the date of receipts in Bombay noted against them. It is most unfortunate that I should have sent no skins when so many passed through my hands. Of course I imagined that they were the Persian Gazelle, and consequently thought no more about the matter. When out shooting I usually kept the heads and as the remainder of the party preferred the skins, all were satisfied.

These Gazelles were found in vast and numerous herds ; on the undulating plain 15 to 20 miles N. E. of Samarra I have often seen from 400 to 600 Gazelle around us during January and February. Herds varied in size, from a dozen to nearly two hundred animals. Several nice bucks would be found in quite small herds, but large herds were chiefly composed of females. I never came across any horned female ; and as recorded in your notes I, too, was much struck by the extraordinary whiteness of the mask in the older animals. I frequently went out with the L. A. M. B. Cars on patrol and, during halts when the supply tenders were left behind, we used to hunt the Gazelle with light Ford cars and sometimes even with motor cycles. The weapons used were shot guns, with the cartridges cut round the centre wad, so that the charge left the barrel like a bullet, and it was a case of a "kill" or clean miss and no wounding. The method adopted was to slowly follow a herd until right on their heels, which could always be done by gradually closing up to the herd without really frightening them. The car was then let out and the herd would bound off at top speed—after a spell of this the bucks invariably left the herd and after them we went, all out, until the shootable bucks were gradually worn down and overtaken and then shot at a few yards range. I most strongly disapproved of the callous and brutal method of chasing a herd in a car, and pumping lead indiscriminately into it with a magazine rifle, where far more animals were wounded and got clean away, than were ever brought to bag. As might be expected they were most excellent to eat. Some does that had been shot in the middle of January and which I examined contained embryos in the foetus stage. Some of the larger heads I measured were 13½″, 13″. 12½″, 12″, 11½″, 11½″, 11″, 11″, 10½″

and many smaller. Two cleaned carcase with the heads off, that I weighed, were 23 lbs. and 18 lbs.

Gazelles, whether of this or another species, were reported very plentiful in the desert between Samarra and Tekrit on the right bank of the Tigris, but I never saw any specimens, heads or skins.

Sus—Sp.—*Wild Boar.*—I first came across the Wild Pig of Mesopotamia in the thick, thorny and almost impenetrable scrub in some of the loops of the R. Tigris on the right bank just downstream of Kut-el-amarah, at the end of 1916 and early in 1917 ; but as they only came out of the cover by night I failed to secure any specimens, though our patrols frequently saw the animals after dark. During the pursuit to Bagdad of the defeated Turkish Forces in March 1917, Pig were found plentiful on the left bank of the Tigris wherever the cover was suitable and though I frequently saw them during my beats for Black Partridge I never actually got a shot at any of them. There appeared to be none on the Euphrates near Feluja and the Hindiyeh Barrage, but probably the cover was unsuitable. In July and August, 1917, I found them plentiful on a small scrub cover island in the middle of the Tigris, a few miles downstream of Baghdad. At that time of the year, the river was so low that on the east the island was joined to the left bank by a broad, muddy depression in which a few shallow pools were situate. At night the Pig used to come and drink from these pools as well as from the river itself on the west. On several occasions on moonlight nights I sat up in " hides " near the river and pools to try and shoot one of these animals, but met with little success.

In September and October 1917 we used to ride them in the country near the Shatt-el-adhaim and have great sport, while also a good many were shot. They seemed to run bigger than the Indian Boar, and were very plentiful. At this time of the year there were many sounders of half grown pigs. These animals were quite easy to shoot at night, as there were only a very few pools where they came to drink, but by day they were hard to turn out of the cover, which was so thick and thorny as to be quite impenetrable in many places. I once put up a very large grey Boar by day, but could not get hold of a rifle in time to have a shot at him. In the early mornings shortly after dawn one used to see small parties returning over the plain to thick scrub and cover in the bed of the Adhaim. I should have secured a few skulls, but the third element amongst my men, usually smashed them up and eat them. It ought not to be very hard to secure specimens and skulls for examination.

In early 1918 we found Pig plentiful in the thick scrub on the left bank of the Tigris near Daur (North of Samarra).

INDIAN DRAGONFLIES.

BY

MAJOR F. C. FRASER, I.M.S.

(*With* 3 *Text-figures*).

(*Continued from page* 122 *of this Volume*).

PART XII.

Genus—ANACIÆSCHNA.

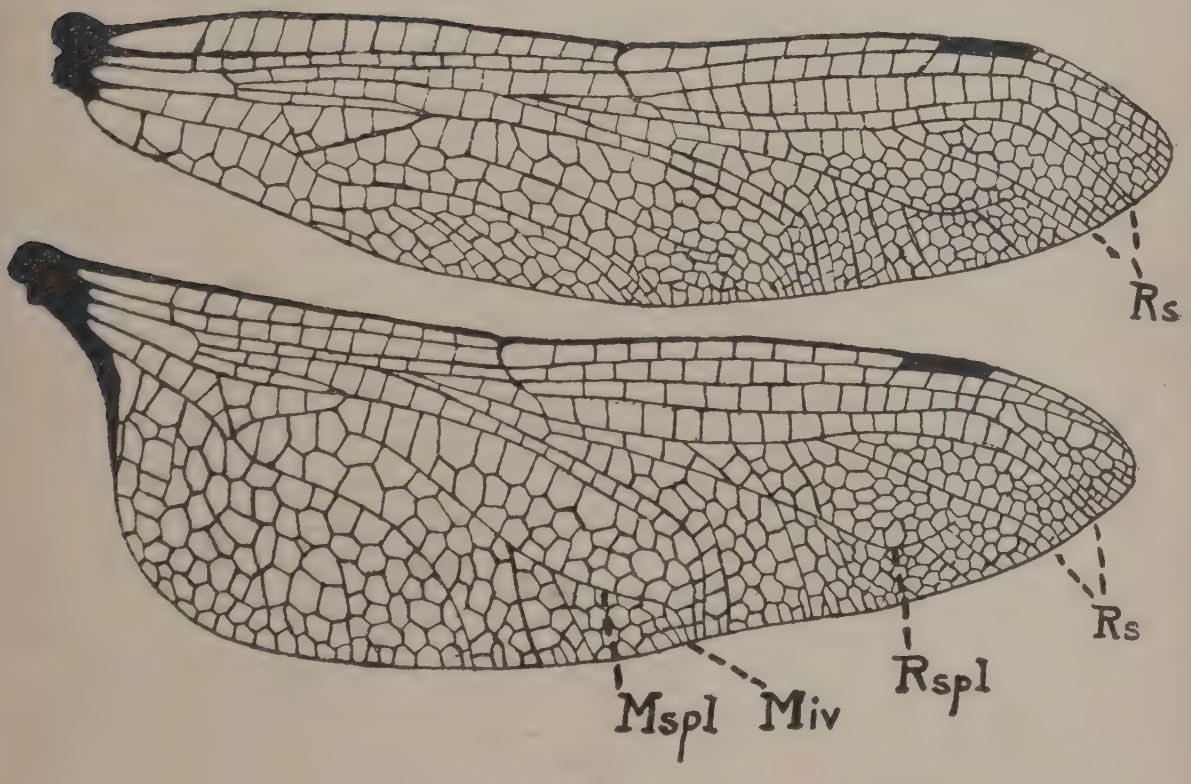

Fig. 1. Wings of *Anaciæschna jaspidea* (x 2·6).

Anaciæschna, Selys, Mitth Mus. Dresd. iii. p. 317 (1878); Bull, Acad. Belg- (3) v.p. 729 (1883); Laidlaw, Rec. Ind. Mus. Vol. xxii, p. 87 (1921); Martin, Cat. Coll. Selys, p. 30, fig. 25 (1909), *Aeschnines*, xix, xx.

Head large, eyes globular and broadly contiguous; occipital triangle very small.

Wings broad, apices a little rounded, reticulation moderately close or close, trigones elongated, of 4 to 6 cells, cubital space and hypertrigones with many transverse nervures, median space entire, *Rs* (5th nervure) bifurcated just below the inner end of stigma which latter is long, narrow and well braced, nodal sector (4th nervure) making an abrupt curve towards the costa at the outer end of stigma, this curve well marked in *jaspidea* less so in *donaldi*, 3 to 4 rows of

cells between *Rs* and *Rspl*, membrane large and prolonged nearly as far as the anal angle, base of hindwing in the male excavated slightly but nearly straight, anal triangle of 3 cells.

Abdomen long and cylindrical, oreillets small, triangular, their posterior margin dentate ; 10th abdominal segment with a small, median, dorsal tubercle, only vestiges of lateral abdominal ridges on segments 4 to 7.

Anal superior appendages long and lanceolate, the inferior subtriangular. Border of 10th abdominal segment in the female subrotundate and subdenticulate beneath ; anal appendages in the same sex lanceolate and foliate.

Only two species of this genus are known, of which the male of one is unknown. *Anaciæschna jaspidea* is the type of the genus and *Anaciæschna donaldi* of which only the female has so far been discovered differs from it only by the reticulation being more close and the nodal sector making only a slight but noticeable curve towards the stigma. Until the male is found, this species can only be placed provisionally in the genus.

Anaciæschna bears a close relationship to *Anax*, the shape of the base of the hindwing and the curve of the nodal sector beneath the stigma approach that of *Anax* whilst the partial obliteration of the lateral, longitudinal ridges on segments 4 to 8 bring it into near relationship with *Hemianax*. The presence of oreillets on the sides of segment 2 and the forking of *Rs* however connect it more closely with *Aeschna*. The genus must be regarded as the connecting link between two large groups.

Anaciæschna donaldi, sp. nov.

Female only known. Abdomen 53 mm. Hindwing 47 mm.

1 female, Kodaikanal, 6,800′ May 1908, (teneral), 1 female from same locality, September 1921, and two others in October 1921, coll. T. B. Fletcher, 1 female, Yercaud, coll. T. N. Hearsey, September 1921, several females seen and taken, Ootacamund, September 1921.

Head. Eyes dark olivaceous brown. the posterior border finely above, more broadly below apple green ; labium and labrum brown, face and frons olivaceous with shadings of blue ; above the frons greenish-yellow marked with a broad, dark brown " T."

Prothorax dark brown coated with a faint, bluish bloom ; posterior lobe simple, rounded and fringed with long hairs.

Thorax rich maroon brown especially on the front of dorsum, marked with brilliant apple green as follows :—2 linear, transverse spots on the interalar sinus, a hook-shaped mark and a small spot on the tergum at the base of the forewings and 2 similar spots at the base of the hindwings. On the sides a moderately broad stripe between the two lateral sutures and an isolated, triangular spot at its upper end and a broad stripe occupying the posterior half or two thirds of the metepimeron.

Legs entirely black. Posterior femora with a row of very closely set, very minute spines.

Wings saffronated throughout, very deeply so in the teneral specimen from Kodaikanal. At the bases of both wings is a deep, diffuse smoky brown marking not quite reaching the costa in front and limited posteriorly by the anal vein but extending into 3 cells of the anal triangle. Outwardly this mark extends to rather beyond the arc.

Stigma yellowish brown ; membrane black, white at the base. Noda index :— $\frac{8—19}{11—12}$ $\frac{19—10}{14—12}$; trigones traversed 4 times in the forewing, 3 in the hind, in all, the proximal nervure is joined to the base of the trigone by a connecting nervure ; 8 to 9 cells in the loop ; *Rs* forked about one cell proximal to the inner end of the stigma in the forewing, 3 cells in the hind ; 3

rows of cells between *Rs* and *Rspl*, 7 cubital nervures in the forewing, 5 in the hind.

Abdomen tumid at the base and gradually tapering to the end. Dark blackish brown marked on the first 3 segments with bright apple green and on 4 to 7 obscurely at the sides with pale yellowish brown. In teneral specimens these spots are pale yellow. Segment 1 has an apical, triangular green mark, segment 2 a small round, dorsal spot on the basal half of the mid-dorsum, a larger, triangular, dorsal spot on the apical half and the sides very broadly apple green, segment 3 has the sides broadly at the base of the same colour, this tapering gradually to the extreme apex.

Anal appendages short and lanceolate. Dentigerous plate closely similar to that of *Anax*, coated with minute denticles.

Hab. Breeding in still water in the lakes at Kodaikanal, Ootacamund, Lovedale and Yercaud. I have provisionally placed this species in genus *Anaciæschna* for reasons mentioned above. No less than 10 females have been seen, all ovipositing by Messrs. Bainbrigge-Fletcher, Hearsey and myself, but none of these were accompanied by the male. Mr. H. V. O'Donel states that *Anaciæschna jaspidea* in Bengal is a night-flyer but neither Mr. Fletcher nor I have detected *donaldi* flying at dusk and indeed the nights are too cold as a rule for these insects to be on the wing. Personally I have searched neighbouring jungles during the day and attempted to beat up the males but without any success. Mr. Bainbrigge-Fletcher and myself have found a very fair number of exuvia clinging to sedges alongside the respective lakes mentioned so that the insect cannot be scarce. The females not uncommonly prefer to oviposit at the outlet of lakes and Mr. Fletcher suggests that the larvæ prefer slow running water to one that is entirely stagnant, but Mr. Hearsey and myself have seen them ovipositing in tanks without any outlet. I watched one particular female for half an hour inserting its eggs into the broad leaves of water lilies well inside the cup formed by the curled up edge of the leaf, but usually they descend into the water until almost up to the thorax.

The larvae when young are very black and keep to grassy shallows on the edge of the tanks and are not difficult to obtain. The full grown larva judged by the exuvium is considerably smaller than that of *A. immaculifrons* measuring only 35 to 38 mm. The sides of the 6th to 9th segments end in robust spines. The mask which is very similar to that of *A. immaculifrons* extends to the bases of the middle pair of legs. Specimens sent to me from Kodaikanal by Mr. Bainbrigge-Fletcher are pigmented black and very clean, whilst those from the Lovedale lake are rust-red due to a protococcus which colours the floor of the lake a similar colour and must serve admirably for purposes of concealment.

Anaciæschna jaspidea, Burm. Handbk. Ent., ii. p. 840. n. 16 (1839); *Æschna jaspidea.* Burm., Handbk. Ent., ii., p. 840. n. 16 (1839); *Anax jaspidea*, Brauer, Reise, d. Novara, Neur. p. 63 (1866); *Anax jaspideus*, Hagen, Verh. Zool. bot. Ges. Wien, xvii, p. 32 (1867); *Æschna tahitensis*, Brauer, Verh, Zool. bot. Ges. Wien, xv. p. 907 (1865); Reise, d. Novara, Neur. p. 73 (1866), Hagen. l. c. p. 48 (1867); *Anaciæschna jaspidea*, Selys, l. c.

Male. Abdomen 47 mm. Hindwing 42 to 46 mm.

Head large and globular; face narrow, yellow; frons of the same colour but the crest marked with a moderately broad, brown line; occiput yellow. Labium and labrum ochreous.

Prothorax bright yellow, especially the posterior lobe which is very large and rounded.

Thorax pale reddish brown, the dorsum ochreous and the sides marked with 2 broad, greenish yellow stripes, the first rather nearer the humeral suture than the lateral, the second covering practically the whole of the metepimeron. There

is also a vestigial, humeral line represented by a small, triangular spot at the upper part of the humeral area.

Abdomen tumid at the base, the 3rd slightly constricted and thereafter cylindrical and parallel sided as far as the anal end. Ground colour ochreous brown marked with yellow as follows:—The sides of segments 1 to 3 with a moderately broad, lateral stripe not reaching below, a basal spot of yellow on segment 1. Segments separated by black annules, segments 4 to 8 with lateral whitish blue stripes not extending as far as the apex of the segments, lessening in size on segments 6 and 7. Segments 6 to 10 have apical, subdorsal spots of the same colour which increase rapidly in size on the latter 3 segments. The dorsum of these 3 segments is a much darker brown than the preceding.

Legs black, the trochanters, coxæ and proximal part of the femora reddish brown.

Anal appendages dark brown, the superior razor shaped, the basal fifths narrow, the apical three fifths strongly ribbed on the dorsal surface in its length, this rib ending at the apex in a robust sharp hook.

The blade portion of the appendage is coated with long, inwardly directed hairs. Inferior appendage triangular, four fifths the length of the superior, turning up at its end.

Wings hyaline, the subcostal space in the forewing as far as the node and the cubital space for about halfway to the trigone palely saffronated. The hindwing similarly so as well as the anal triangle and a large area extending across the wing from the trigone to the stigma. Stigma yellow or brownish yellow, membrane grey, white at the base; nodal index:— $\frac{8-16}{11-9}\ \frac{16-9}{10-11}$, 4 to 5 cubital nervures in the forewing, 3 to 4 in the hind, trigone in the forewing traversed 3 to 4 times, 3 times in the hind, the proximal nervure in the trigone of the forewing never connected to the base of the trigone by another nervure as in *donaldi*, always so in the hind, reticulation closer than in *donaldi*.

Female closely similar to the male, the ground colour being a paler brown. The abdomen more tumid at the base, not constricted at the 3rd segment but tapering gradually to the anal end. The colouring on the sides of segments 1 and 2 spreads on to the dorsum. The spots on the other segments are rather broader than in the male and segment 10 is entirely yellow.

Anal appendages lanceolate, shorter than those of the male.

Dentigerous plate resembles closely that of *Anax*, the hinder border being subrounded and its surface coated thickly with minute denticles.

Hab. Mr. H. V. O'Donel informs me that in the Duars this species is a night flyer. Before dusk it flies high but as night falls it descends to lower levels and is seen skimming near the ground. Occasionally it comes to light.

The species appears to have a wide range, being recorded from Bengal, Upper Burma, Java, Sumatra, Lombok, Borneo, Formosa and Tahiti.

Group—ÆSCHNA.

Under this heading I have grouped a number of genera which differ rather widely in characters but all agree in having *Rs* (5th nervure) symmetrically forked and *Rspl* (5*a*) and *Mspl* (7*a*) strongly concave towards *Rs* and *M4* (7th nervure) respectively so that the two nervures enclose 3 to 6 rows of cells.

Correctly speaking *Anaciæschna* should be included in this group but on account of its intermediate characters I have preferred to assign it a position where it links up the two groups *Anax* and *Aeschna*.

The eyes are large, more or less contiguous but usually less so than in *Anax*; frons moderately broad, occiput usually small and simple; wings long and broad, reticulation close, base of hindwing angulated or excavate in the male; dentigerous plate of female and anal appendages of the male markedly specialized.

Genus—*Æ*SCHNA, Fabr.

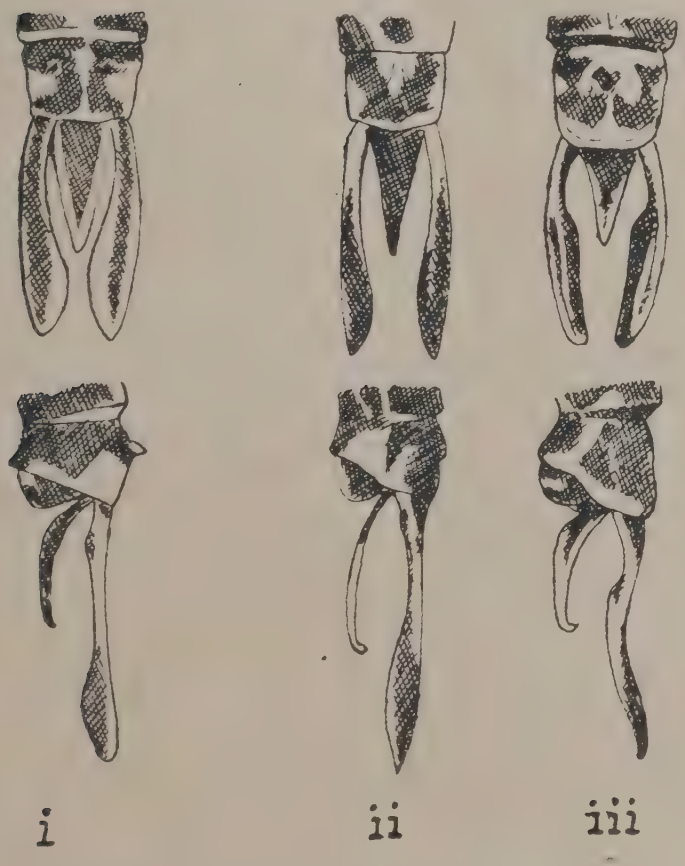

Fig. 2. Anal appendages of (i) *Æschna juncea,* (ii) *Æschna mixta,* (iii) *Cephalœschna masoni.*

Æschna, Fabr., Syst. Ent., p. 424 (1775); Leach., Edinb. Encycl., ix, p. 137 (1815); Steph., Ill. Brit. Ent. Mand., vi., p. 82 (1836); Ill. Mag. p. 126 (802); Selys, Mon. Lib. Eur., p. 98 (1840); Rev. Odon., p. 112 (1859); Bull. Acad. Belg., (3) v. p. 728 (1883); Ramb., Ins. Nevr., p. 192 (1842); Kirby, Cat. Odon., p. 86 1890); Laidlaw, Rec. Ind. Mus., Vol. xxii., p. 75 (1921).

Eyes moderately contiguous; frons moderately rounded as seen from above; occiput small or mediocre; wings moderately broad and long, reticulation close or moderately close; trigones elongate, of 3 to 5 cells; subtrigones entire or of 2 cells, cubital space and hypertrigones traversed several times, the latter rarely free. 5th nervure (*Rs*) bifurcated after the level of or before the inner end of stigma; stigma short or long; arcular (basal) space entire; membrane variable; anal border of hindwing in the male excavated; anal triangle long and narrow, divided into 2 or 3 cells. Abdomen subcylindrical, generally tumid at the base and constricted at the 3rd segment; anal appendages large or mediocre, sub-lanceolate, the inferior long and narrow, subtriangular or a little truncate at the end.

Female with the 10th abdominal segment subrounded below (the dentigerous plate) subdenticulate or spined. Anal appendages variable.

Hab. Cosmopolitan. Type of genus, *Aeschna, juncea,* Linn.

Æschna mixta, Latr. Hist. Nat. Crust. Ins., xiii., 7, (1805); Charp. Hor. Ent., 35 (1825); Charp., Lib. Eur., 110 t. 19 (1840); Selys, Mon. Lib. Eur., 102, (1840); id. Rev. Odon., p. 122 (1850); McLach. Cat. Brit.

Neur., 15 (1870); Kirby, Syn. Cat. Neur. Odon., 88 (1890); Bath, Handbook Brit. Drag. p. (1890); Lucas, Brit. Drag. p. 177 (1900) Martin, Cat. Coll. Selys, *Æsch.* xix-xx. p. (1909) ; Laid., l. c. p. 88

Æschna mixta, Hagen, Ent. Ann., 52 (1857).

Libellula coluberculus, Harris, Expos. Eng. Ins. 91, t. 27 f. i. (1782).

Æschna coluberculue, Kirby, Cat. Odon., (1890).

Æschna affinis, Steph., Illus. Brit. Ent. Mand., vi., 85 (1830); Evans, Brit Lib., 22 t. 12 f. 2 (1845).

Æschna alpina, Selys, Rev. Odon., 125 (1850), id Rev. Zool , (1848) p. 16.

Male. Abdomen 45 mm. Hindwing 38 mm.

The name "*coluberculus*" has priority of claim but as there is considerable doubt as to whether Harris description was intended for "*mixta*" or "*juncea*" it seems better to adhere to "*mixta*," a name which has come into general usage.

Head: Labium ochreous; labrum greenish yellow surrounded with a border of black; epistome and frons greenish yellow, the upper surface of the latter marked with a black "T" mark. In front of the eyes is a black line confluent with the stalk of the "T"; vesicle and occiput yellow; eyes broadly contiguous, deep blue in the living state.

Prothorax dark brown, yellowish at the sides.

Thorax brown marked in front with a vestigial spot of yellow on each side, the rudiment of an antehumeral stripe and on the sides by two broad, oblique stripes of bright yellow. The tergum spotted with yellow at the bases of the wings and in the middle line.

Legs robust, black.

Wings hyaline, costa brown, neuration black; stigma dark brown, 3-5 mm. in length; membrane white bordered with greyish, of moderate size.

Abdomen tumid at the base, constricted at the 3rd segment and then of uniform width and cylindrical to the end, dark brown spotted with blue and yellow as follows;—1st segment brown on the dorsum, yellow on the sides, 2nd segment with a narrow triangular, bright yellow mark on the basal half of the dorsum, 2 narrow, linear, transverse streaks at the middle, separated by but not confluent with the first marking, apical half of the segment blue changing to yellow on the sides, 3rd to 8th segments with 2 transverse streaks of blue about the middle of segments separated by the dorsal carina, on the sides an elongate spot of blue extending from the base for about two thirds the length of the segments, apically large, dorsal, subtriangular spots of blue.

On segment 8 the lateral spot is very small, segment 9 has the apical spot but not the other two, segment 10 has a lateral, squarish spot of yellow.

Anal superior appendages dark brown, flattened, sublanceolate, curled corkscrew fashion, pointed at the end, coated with long hairs at the apical half. Inferior pale yellowish brown, narrow, curling strongly up at the end, about four-fifths the length of the superior.

Female somewhat similar to the male, differing as follows:—

Abdomen 48 mm. Hindwing 38 mm.

Labium, labrum and face brownish yellow; eyes greenish instead of blue. Wings rounded at the anal angle. Abdomen more tumid at the base, not constricted at the 3rd segment. 2nd segment without the blue on dorsum and the spots on other segments greenish yellow instead of blue.

Anal appendages long, lanceolate, blunt at the end, without the hairy coating except for the marginal fringe. Dentigerous plate short, its posterior border quite straight, coated with minute, black denticles.

Nodal index:—$\frac{9\text{-}15 \mid 15\text{-}8}{10\text{-}9 \mid 9\text{-}10}, \frac{9\text{-}15 \mid 14\text{-}8}{9\text{-}9 \mid 9\text{-}9}$ trigones rather short, 4 cells in all, 4 to 5 cubital nervures in both wings, 8 cells in the loop, hypertrigones traversed once or twice in both wings.

Hab. Kashmir only, within Indian limits but elsewhere extending across Europe and the British Isles. I have only seen British specimens of this species but they do not differ in any way from that recorded from Kashmir. The species has also been reported from North Africa.

Æschna juncea, Linn., Syst. Nat., i., 544, n. 10 (1758).

Æschna juncea, Steph., Illus. Brit. Ent. Mand., vi., 84 (1835); Evans, Brit. Lib., 21, p, ii. f. 2 (1845.)

Æschna juncea, Selys, Mon. Lib. Eur., 106 (1840); id. Rev. Odon., 116 (1850); Hagen, Neur. N. Amer., 120 (1861); McLach., Cat. Brit. Neur., 15 (1870); Kirby, Syn. Cat. Odon., p. 87 (1890); Lucas, Brit. Drag. p. 189 (1900); Bath, Handb. Brit. Drag. p. (1890); Martin, Cat. Coll. Selys., *Æsch.* xix, xx (1909).

Æschna juncea, Hagen, Ent. Ann., 53 (1857).

Libellula quadrifasciata, var. *E. ocellata*, Mull., Nov. Aet. Leop.-Carol 61 (1764).

Libellula oceliata, Mull., Nov. Act. Acad. Leop-Carol., iii., p. 125 (1767)

Æschna ocellata, Hagen., Syn. Lib. Eur., 54 (1840).

Æschna rustica, Zett., Ins. Lapp., 1040 (1840).

Æschna picta, Charp., Lib. Eur., 112, t. 20 (1840).

Æschna caucasiaca, Selys, Rev. Odon., 300 (1850).

Æschna propinquia, Scudd., Proc. Bost. Soc. N. H., x,, 215, (1866).

Male. Abdomen 55 mm. Hindwing 45 mm.

Head. Labium orange, sometimes bordered with dark brown, labrum yellow, bordered finely at the base and free border with brown; lower epistome and frons bright yellow, the suture between them marked out in black; upper surface of frons bearing a black "T" shaped mark which spreads forwards over the crest; vesicle bright yellow; occiput yellow; eyes deep sea blue.

Prothorax brown with a yellow posterior lobe.

Thorax dark brown marked with 2 narrow, antehumeral bright yellow stripes and 2 moderately narrow, greenish yellow stripes on the sides both bordered narrowly with black; attachments of wings spotted with yellow; tergum spotted with blue,

Legs black, bases of anterior pair of femora yellow.

Wings hyaline, occasionally faintly enfumed; costa bright yellow, reticulation black; stigma narrow, about 4.2 mm. in length, yellowish brown; membrane short and broad, nearly quadrilateral, not extending as far as the nervure which traverses the anal triangle transversely, its base white, otherwise ashy; anal triangle with only 2 cells; Nodal index:—$\frac{12\text{-}19 \mid 18\text{-}11}{14\text{-}12 \mid 13\text{-}13,}$ trigones in the forewing traversed 3 times, twice in the hindwing, the basal nervure in each case connected to the base by a transverse nervure; 10 to 13 cells in the loop; cubital nervures in the forewing 6, in the hind 5; hypertrigones traversed 3 to 4 times in the forewing, twice in the hind; 3 rows of cells between the bifurcation of *Rs* (5th nervure) and 4 to 5 between *Rs* and *Rspl* (5th and 5*a* nervures).

Abdomen tumid at the base constricted at the 3rd and thereafter cylindrical and of even width to the end, blackish brown marked with yellow and blue as follows:—1st segment with a transverse subbasal streak of blue and a lateral, streak of yellow on the sides, 2nd segment with a bright yellow and a linear transverse streak of the same colour on either side of it, apically a large spot of blue on either side separated by the dorsal carina and connected with a bluish and yellow spot lower down on the side, 3rd to 8th segments with fine, linear transverse, yellow, dorsal streaks situated slightly nearer the base than the apex large, apical subdorsal, subtriangular, blue spots and 3 lateral spots of yellow or greenish blue; on the 3rd segment the basal one of the latter 3 spots is very

large and clear blue in colour, on the 8th segment, the apical spot is usually absent and the 9th and 10th segments have only the blue, apical, subdorsal spots.

Anal appendages dark brown, sublanceolate, strongly ribbed, pointed at the end. The inferior appendages are about three-fourths the length of the superior and narrowly triangular.

Female very similar to the male, differing as follows :—eyes an emerald green; abdomen very tumid at the base and not constricted at the 3rd segment ; the spots on the abdomen which are blue in the male are apple green in the female. Anal superior appendages shorter, lanceolate. Dentigerous plate similar to that of *A. mixta.*

Hab. I record this as within Indian limits on the strength of a single male specimen in the British Museum labelled from Kashmir. I see no reason why this should not be correct as outside Indian limits *A. juncea* is found throughout Central and Northern Europe and it may very naturally spread throughout Central Asia and Siberia.

The species closely resembles *A. mixta* from which it may be distinguished by the shape and size of the membrane. In *mixta* it extends along the base of the wing to beyond the transverse nervure of the anal triangle, whilst in *juncea* it stops well short of this nervure. The anal triangle in *mixta* has 3 cells, and only 2 in *juncea.*

Æschna ornithocephala, MacLach., Ann. Mag. Nat. Hist., (6), xvii, p. 368 (1896) ; Martin, Cat. Coll. Selys, *Aesch.*, p. 63, fig. 59 ; Laid., Rec. Ind. Mus., Vol. xxii., p. 88 (1921).

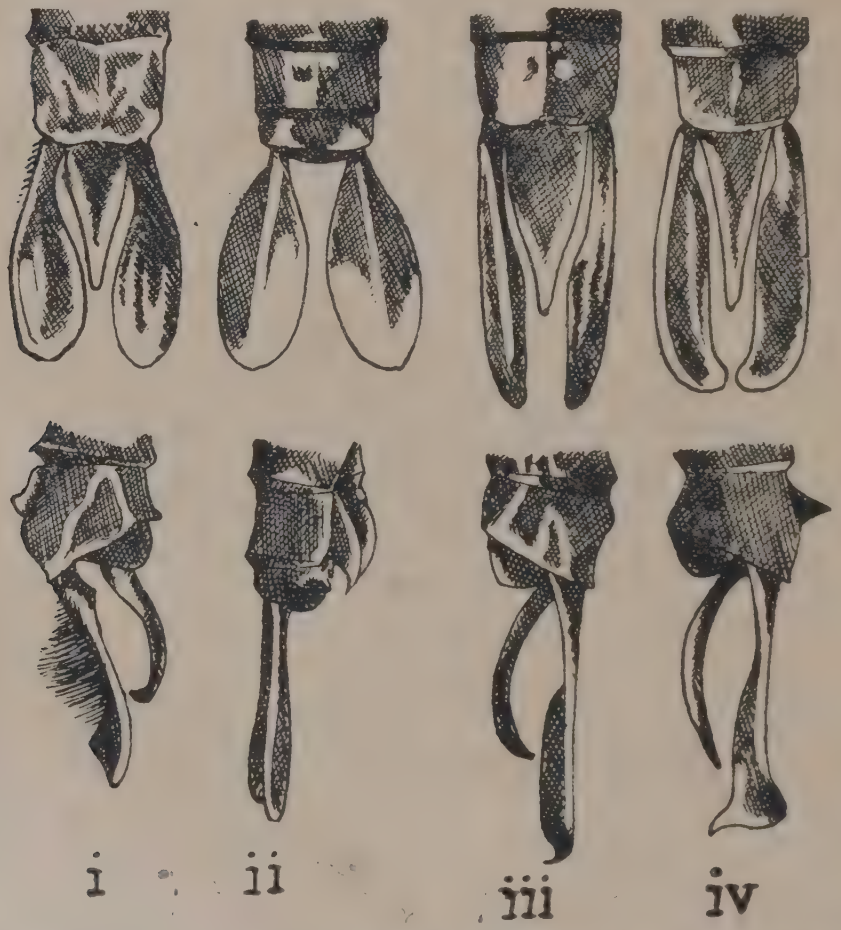

Fig. 3. Anal appendages of (i). *Æschna erythromelas,* (ii). *Æschna petalura.* (iii). *Anaciæschna jaspidea,* (iv). *Æschna ornithocephala.*

Male. Abdomen 56 mm. Hindwing 46·5 mm.

Head. Eyes olivaceous green, very broadly continguous ; occiput very small, black ; vesicle black ; labium bright ochreous ; labrum bright green bordered with bright ochreous ; face and frons bright green, the latter deep brownish black above.

Prothorax brown.

Thorax maroon brown marked with sage green as follows :—narrow, antehumeral bands, moderately broad posthumeral bands and the whole of the metepimeron.

Wings hyaline, but slightly enfumed throughout ; nodal index:— $\frac{14–17}{13–12}$ $\frac{18–12}{11–14}$,

trigone in forewing made up of 3 cells, in the hind 2 ; cubital nervures in the forewing 5, 3 in the hind ; anal triangle with 3 cells, the loop with 5 ; *Rs.* (5th nervure) bifurcates at the outer end of the stigma and encloses a double row of cells ; stigma rather small, 2·5 mm. brownish black ; membrane ashy white with a streak of brown at its attached border.

Legs reddish brown, the middle and hind femora with a row of small, very closely set spines, tarsal spines long and numerous, claw hooks robust, situated about the middle of the claws.

Abdomen a little tumid at the base, only very slightly constricted at the 3rd segment. Oreillets moderately large. General colouring blackish brown marked as follows:—a broad band of sage green extending along the sides of the 1st, 2nd and basal fourth of the 3rd segment, an apical, transverse stripe of green on the 1st segment, a dorsal stripe of the same colour on the 2nd somewhat constricted at its middle, apical green annules on the 3rd to 8th segments and dorsal green triangles on the 3rd to 7th. Segments 9 and 10 are unmarked.

Superior anal appendages of curious shape, petiolated at the base and broadening rapidly afterward, the end somewhat quadrate and furnished with a robust spine which is directed inward and backward. This portion has been compared to the head and beak of a bird from which the insect derives its name. Brownish black, furnished with rather long hairs. The inferior appendage about three-fourths the length of the superior, triangular, curving strongly throughout its length. The dorsum of the 10th segment is furnished with a robust spine.

Females differing rather widely from the male, and of much more robust build. The markings on the thorax and abdomen are similar but the dorsal markings of the abdomen are yellow instead of green, the lateral markings being green only as in the male.

Abdomen 52 mm. Hindwing 51 mm. The ratio of the wing and abdominal lengths is nearly the same here, whereas in the male there is a difference of 10 mm.

Face and frons olivaceous green with a tinge of ochreous ; eyes deep brown. Ground colour of the abdomen a rich reddish brown ; legs black, the bases of femora reddish.

Wings very broad, the tornus rounded. Hyaline but the area extending from a little proximal of the node to the distal end of the stigma a moderately deep smoky brown. stigma nearly black ; membrane white. Loop with 7 to 8 cells ; hindwing has 4 cells in the trigone ; nodal index :— $\frac{14–2}{17–14}$ $\frac{19–17}{13–14}$,

6 and 4 cubital cells in the fore and hindwings respectively, other features as for the male.

Dentigerous plate rounded, flattened and deflected posteriorly, the ovipositor passing through it. Its border, furnished with a few scanty spines and its inferior surface with smaller spines.

Anal appendages short, narrow and lanceolate.

Hab. This and the following species, as well as the whole of the species of *Gynacantha* are alike in possessing the curious habit of ovipositing in dry earth. Dr. Laidlaw quotes an interesting note made by Dr. Annandale on a number of females which he observed ovipositing in dry, earthy banks about one to two feet above water level. Five or six eggs were deposited with great rapidity in each spot. The anal appendages in this species are very short and so are not liable to damage whilst performing this operation as they are invariably so, in the *Gynacantha*. The dentigerous plate is employed by the insect to obtain a purchase for the end of its abdomen whilst drilling the hole for each egg, the spines preventing any slipping.

I am indebted to Mr. H. Stevens for examples of this interesting and fine insect. Darjiling District and Northern Assam are the districts to which this insect is restricted.

Æschna erythromelas, MacLachlan, Ann. Mag. Nat. Hist., (6), xvii., p. 419 (1896), Martin, Cat. Coll. Selys, *Aeschnines*, p. 62, fig. 58. Laidlaw, Rec. Ind. Mus., Vol. 88, p. 88, (1921).

Male. Abdomen 68 mm. Hindwing 53 mm.

Female. Abdomen 60 mm. Hindwing 57 mm.

Male.

Head. Labium, labrum and epistome brown; frons olivaceous with a broad, ill-defined, black, T-like mark on its upper surface and slightly overlapping its anterior surface; eyes brown but probably greenish during life, broadly contiguous; occiput small, black.

Prothorax and thorax dark brown, the latter with a green, antehumeral band on each side and two very broad, similarly coloured bands at the sides.

Legs black, the femora with reddish spines.

Wings hyaline, the costa black; stigma very small, black; membrane white; anal triangle with 3 to 4 cells; *Rs* (5th or subnodal sector) forked at the level of the inner end of the stigma and enclosing 5 to 6 rows of cells between it and *Rspl* (5*a*), trigones with 5 to 6 cells in the forewing. 5 in the hind; 4 to 5 nervures in the hypertrigone of forewing, 4 in the hind; nodal index; $\frac{17\text{–}24}{18\text{–}17}$ $\frac{26\text{–}17}{16\text{–}19}$; 11 cells in the loop.

Abdomen very long and cylindrical, the base tumid, tapering rapidly from the 3rd segment, oreillets small but prominent, lobes of the sexual organs on the 3rd segment prominent, quadrate. Colour reddish brown marked with yellow as follows:—segment 1 has a fine, lateral, apical streak, segment 2 has 2 median spots, a fine yellow annule and the sides rather broadly yellow, segment 3 has a continuation of the yellow on the sides, two median spots and an apical annule, segments 4 to 7 have the same median spots and apical ring, segments 8 to 10 are unmarked. The latter segment has a blunt tubercle or low ridge on its dorsum and its dorsal carina is pronounced.

i. Terminal segments of abdomen of *Æschna erythromelas* showing (*a*) dentigerous plate.

ii. The same of *Æschna ornithocephala*.

Superior anal appendages black, seen from above they are spatulate and very broad. seen in profile they are strongly curved especially at the ends. At the base and beneath there is a robust tubercle and on the upper surface of the apex, a small tubercle. The apical two thirds is thickly coated with long hairs on its upper surface. The superior appendages equal in length to the last two abdominal segments, the inferior rather more than half the length of the superior, curving up strongly to meet the superior, its end furnished with a small, recurved hook.

Female.

Very similar to the male but much more robust, the wings broader, the abdomen stouter and shorter relatively. The thorax reddish brown with the same markings as for the male, the abdomen a rich ochreous or reddish orange. The 1st segment on the dorsum and the base of the 2nd marked with green, all other segments unmarked. The 8th, 9th and 10th segments are mostly black, the ground colour exhibited only as spots of reddish.

Legs back, red at the base.

Anal appendages small, leaf-like pointed at the apex, black, a little longer than the 10th segment and separated by a hairy protuberance.

The dentigerous plate prolonged into an acute arch through which the ovipositor passes. Its free border below furnished with about 10 robust spines, its surface free of spines.

Æschna petalura, Martin, Cat. Coll. Selys, *Aeschnines*, pp. 78-79, 1909. Laid. Rec. Ind. Mus., Vol. xxii., p. 89, 1921.

Male. Abdomen 63 mm. Hindwing 53 mm.

Head. Face and frons yellow, the latter with a badly defined, black T-shaped mark above on a brownish background ; eyes large, broadly contiguous ; occiput small black.

Thorax blackish, marked with a yellow, antehumeral line on each side of the dorsum and two very broad, yellow bands on each side. Legs black.

Wings hyaline ; stigma black, very small ; trigone with 6 cells ; hypertrigones traversed 5 times ; forewing with 25 antenodal nervures and 15 postnodals ; membrane yellowish white ; anal triangle with 3 cells ; *Rs* (5th or nodal sector) bifurcating at the level of the inner end of stigma.

Abdomen cylindrical, slender, slightly tumid at the base and slightly constricted at the 3rd segment. Dark brown marked with pale spots but slightly apparent. The sides of the 2nd segment pale yellow and apical rings on segments 3 to 6. The 10th segment with a slightly elevated tubercle on the dorsum.

Anal superior appendages black, very hairy, petiolated in the basal fourth, then broadening into a spatulate foliation, rounded at the apex. Inferior rather more than half the length of the superior.

Female. Very similar to the male. Occipital triangle yellow.

Thorax dark brown marked with a green antehumeral line on each side of the dorsum and two broad yellow stripes on the sides.

Abdomen much stouter than that of the male, tumid at the base and cylindrical thereafter to the anal end, dark brown on the dorsum, paler low down on the sides. Marked with pale brown or yellow spots as follows :—1st segment yellow on the dorsum, 2nd segment with a basal, dorsal triangle, 2 transverse stripes about the centre of the dorsum separated by the dorsal crest and finally an apical ring of yellow broken by the dorsal crest, segments 3 to 7 with the same dorsal stripes in the middle of the segment and the apical ring, segments 4 to 7 have additional dorsal points of yellow, 8 has only the apical annule which is broadly broken by the dorsal crest, 9 has some yellow on the lower part of the sides and 10 is unmarked.

Anal appendages similar to the male but larger and broader.

Wings saliated ; stigma brown, very small ; trigone of forewing with 5 cells, 4

in that of the hind; *Rs* bifurcated a little before the origin of the stigma; membrane large, yellowish white; hypertrigones traversed 3 times; nodal index :—

$$\frac{12\text{–}19 \mid 20\text{–}14}{16\text{–}14 \mid 16\text{–}18}$$

, reticulation open.

Hab. Darjiling District and Khasia Hills. I have not seen a specimen of this insect which must be very rare or local. Concerning it Dr. Laidlaw states that it is scarcely a true *Aeschna* giving as reasons the difference between the trigones in the fore and hindwings and also the few rows of cells (3 rows only) between *Rs* and *Rspl* (5th nervure and 5*a*).

Æschna annulata, Fabr. Ent. Sys. supp. (1798).

The type of this species has been lost and it is doubtful as to which species Fabricius referred. His description is meagre :—size median, head obscurely yellow, thorax brown and hairy, abdomen cylindrical, pale yellow with the margins of segments black. Legs yellow.

Hab. India.

Æschna, sp. nov. B. M. No. 98/242, Sikkim, 2,000′, June 1895, coll. J. G. Pilcher.

I have seen a single female of a species of *Aeschna* in the British Museum indicated from Sikkim which does not belong to any described species. The altitude given is obviously wrong.

The following is a description of the insect but I regret that at the time of examining it I failed to note the character of the dentigerous plate.

Female. Head—Face and labrum bright yellowish green variegated with lines of bright ochreous; labium yellow with a spot of greenish in the middle; frons with a broad, black crest; occiput simple, brown bordered with dirty yellow.

Thorax brown or it may have been dark green during life, marked with 3 fine, black lines on the humeral and lateral sutures, the middle line being incomplete in its upper half. The front of thorax marked with dark green antehumeral bands.

Abdomen dark brown marked with blue, this latter has a large apical, dorsal spot on each segment from 3 to 7 on each side of the dorsal carina which barely separates the two. The remainder of the abdomen is unmarked, probably the spots having faded from decomposition.

Anal appendages short, lanceolate, brown.

Wings hyaline but a little enfumed and saliated; stigma reddish brown, 3.5 mm.; membrane ashy white at the base, pale brown along the lower border; trigone with 6 cells in the forewing, 5 in the hind; all hypertrigones traversed 4 times; nodal index :— $\frac{15\text{–}23 \mid 24\text{–}18}{19\text{–}16 \mid 17\text{–}19}$; loop with 10–17 cells; 7 to 8 cubital nervures.

(To be continued.)

NOTES ON SOME LIZARDS, FROGS AND HUMAN BEINGS IN THE NILGIRI HILLS.

BY

COL. F. WALL, I. M. S., C. M. Z. S.

LACERTILIA.

Chamæleo calcaratus.—The Indian Chameleon.

I saw several specimens of this lizard, chiefly at low elevations (below 3,000 feet). It ascends to the height of Coonoor (6,200 feet) and possibly above this. When molested it hisses loudly and bites a stick or other object with great malice. A lady brought me one that she encountered on the road to Lamb's Rock. It made so much noise and was so menacing that her rickshaw cooly was scared and refused to go further. Not knowing in the least what she was dealing with, she endeavoured, in spite of her alarm, to catch it, and finally succeeded single-handed in getting it into her semi-closed umbrella. Here it swore audibly all the way back and although the cooly had strenuously opposed rendering any assistance in the capture he demanded extra " bakshish " for his courage (?) in conveying this additional and unexpected passenger home. I liberated it, and watched its slow and measured ascent into the branches of a nearly leafless tree. Here it remained all day, an object of interest to every one in the Hotel. It had disappeared next morning. The male claspers of one I killed were cylindrical and not bifurcated.

Draco dussumieri.—Dussumier's Flying Lizard.

I only saw one of these interesting creatures actually in flight. This was at about 3,000 feet elevation. After a volplane, the commencement of which I did not witness, it alighted audibly on the trunk of a tree about ten feet from the ground. I had a side view of the flight, and noticed that there was no *actual* ascent at its termination, but a slight *apparent* ascent owing to the lizard converting a horizontal posture into a vertical one, as it came to rest.

Charasia dorsalis.

This lizard is extremely common all over and above Coonoor. It is dark brown dorsally, and harmonises with the rocks which form its home. It is very active and wary and disappears into any convenient cranny when approached. The body is remarkably depressed and this enables it to secrete itself in extremely narrow fissures. The male when excited assumes a black hue, and exhibits a bright pink moustache stripe, which makes it a very striking object. It is very difficult to capture. One that I shot lost its beautiful colouration as if by magic, and I could hardly believe it to be the same creature whose beauty had arrested my attention a few seconds before.

The brilliancy of colour appears to be a demonstration of excitement, and, as in many other lizards, is only exhibited by the male. Some naturalists would have us believe that, as in the case of brillant plumage in birds, it has been evolved by natural selection, the female selecting the male as her mate who has the most brilliant display at his command. This beautiful theory is on a par with a great many other theories elaborated with great ingenuity by modern naturalists. It is pure nonsense in the case of lizards, and if so in lizards, why not in birds ? The fact is that with lizards the females make no choice. I have witnessed on many occasions the act of mating among many lizards especially those of the genus *Calotes*, many of which display very brilliant colours. The male with flaming head (in the case of *C. versicolor*) on sighting a female rushes upon her. She scuttles away as fast as she knows how, but is overtaken, overpowered and ravished in the most flagrantly brutal fashion. In such circumstances how

can the flaming head be claimed as a lure or charm ? On the contrary past experience must make this a warning colour to the female, and obviously does, because she flees precipitately before it. The modern naturalist of the " warning colour school " having read this will assuredly sit at home, and concoct a wonderful story as another proof of his pet theory.

Many modern naturalists—Cabinet naturalists chiefly—remind me of the Greek philosophers who were regarded as omniscient. One of these—Socrates I think it was—explained honey dew as "the sweat of the heavens, the saliva of the stars, or a liquid formed by the purgation of the air."! It is difficult to imagine that the credulity of the people contemporary with him was such that it could be imposed upon by such an oration. One would suppose that even a person of dull perceptions would ask why the heavens only sweated beneath trees, or why the stars salivated so copiously in the day time or again what agent caused the purgation of the air. Any moderately endowed observer of the times would, if he had examined the trees, have discovered the real cause—the aphis. It does not need a microscope to reveal its presence, but is easily seen by the naked eye. The philosopher you will notice was wily enough to add two alternatives, in case the first did not carry conviction. It appears to me many modern naturalists are as ingenious and cryptic as the said Socrates, and they are contemporaneous with a public just as gullible and capable of swallowing a camel as a gnat, as the public of his day.

Salea horsfieldi.—Horsfield's Lizard.

This is a very common species below the altitude of Coonoor. Under excitement the male is an extremely beautiful object, being of an intensely brilliant verdant green dorsally, merging to yellow on the head. The gular pouch is a brilliant yellow, and the belly pearly-white.

Gonatodes jerdoni.—Jerdon's Gecko.

This dusky little gecko may be more abundant than it appears. I only saw three, and all in the same spot. I noticed one day a movement on a mossy wall behind the notice board opposite the Post Office at Coonoor. A cautious approach and careful inspection revealed a gecko quite new to me. A smart stroke and " father " was beneath my hand. A further scrutiny and I noticed another. " Father " having been transferred to my left, I made another quick stroke with my right hand and " mummy " was struggling beneath. Further search disclosed the pride of the parents. " Mummy " joined " father " in my left, another stroke and I had the whole family.

At this juncture I found myself the centre of a gaping crowd, numbering two policemen—evidently thinking I had evil designs on the notice board—half a dozen rickshaw coolies, as well as ayahs and babies, and, as luck would have it, a lady acquaintance passing by extended her hand which I was unable to grasp, having none to offer, both being engaged by my struggling captives.
These are very trying moments in a naturalist's life !

BATRACHIA.

Genus Ixalus.

Ixalus variabilis.—The Common Castanet Frog.

Even the most uninterested and unobservant visitor to the Nilgiri Hills cannot fail to notice and remark upon the multitudes of clap-like sounds that emanate from every bush during the rains. Most visitors no doubt not only remark upon them but wonder what sort of creature produces them.

Having some knowledge of Batrachians I expected to find they were produced by frogs, and I set to work to discover the species concerned. I found this by no means the easy task I had expected, although the sounds reached me from far and near on every side. As soon as I directed my attention to one individual

spot, and cautiously approached it, the sound so often repeated suddenly ceased. At this stage the frog forgets all about his lady love to whom his song is addressed and like " brer rabbit lies low and says nuffin." A contest of patience would then ensue between us, the frog remaining silent and I immobile, he waiting for me to go, and I pretending I wasn't there. The frog won every time. My patience exhausted, I listened attentively to another vocalist and tried to track him down. At close quarters I would scan the ground and the foliage for a moment for a glimpse of him, but unsuccessfully. This went on for some days. At intervals I would stand out in the rain, in view of other visitors in the hotel, peering into a hedge apparently at nothing. This behaviour aroused suspicion among certain visitors who did not know me and my ways, and my sanity was questioned. At last after repeated failures I offered a reward of four annas to any one who could find the mysterious ventriloquist, and in a few minutes all the idle rickshaw coolies in the hotel were on the warpath after the elusive little creature. After the lapse of a considerable interval one man brought me a tiny little frog about an inch long which was obviously a tree frog from its dilated toes. Later another of the same kind was brought and then as if by magic every cooly had a dozen or so to offer me. Then I sallied forth to learn the secret of their discovery. At the back of the hotel was a narrow little water channel that flowed into a masonry catchpit for the use of the malis when watering the garden. At the edge of this little channel were many arum lilies, and if one searched these plants systematically a frog was sure to be disclosed in one of the hollow stems just above where it clasps the root. I also found it in other similar plants such as wild ginger, and caladiums. Having collected several specimens in various jars, and given them foliage and water, my next concern was to hear what sounds would emanate therefrom, but they remained strangely silent all day. Prison quarters were evidently not conducive to love making. At night I placed the jars close to my bed and when the light was out, first one and then another piped up and to my delight the author of the clapping notes had been unmasked.

The next morning I identified the species as *Ixalus variabilis*. It is a pretty little brown creature, one inch or slightly longer, with a shapely body, large lustrous eye and very short, rather pointed snout.

The note in this particular species is a monosyllabic short, sharp clap, reminding one of the noise made by a clapper to scare birds, or that made by castanets, and is remarkably loud considering the diminutive creature that produces it. It is certainly audible 30 or 40 yards away, and is produced by the male, who blows out his vocal sac, so that his throat swells to the size of a small marble. The sound is emitted when the sac is at its extreme limit of distension, and the sac then collapses like a burst bubble. In a few moments the vocalist again inflates his sac and emits another loud clap.

During fine weather these sounds are not so much in evidence, but as soon as it rains the comparative silence of the welkin is replaced by a clamorous outburst from every castanet frog, who endeavours to outrival his neighbours in announcing his whereabouts to his lady love. At night a few desultory claps are to be heard when fine, which swell to a tumultuous chorus with the advent of a shower.

This little frog is so plentiful and so small that it forms the staple food of most of the frog-loving snakes. It is a convenient size for small snakes to eat, and many are not content with one for a meal, but swallow two or three at a time.

The stomachs of those I opened were plentifully stocked. A caterpillar that feeds on the arum is frequently taken. I found crowds of small spiders and many dipterous insects, one in particular being a peculiarly bright iridescent green species.

As regards matrimonial affairs I failed to elicit any thing. I never saw the

frog in water, but many females were heavily egg-bound in July and one is left wondering whether fertilisation is effected in that element or not.

Ixalus signatus.—The X Castanet Frog.

This attractive little species resembles the last very closely. It is quite as diminutive, brownish in colour, and is easily recognised by the large deep brown X on its back. Like the last I found it difficult to locate. In fact I failed to identify it from its note on my first visit to Coonoor. A second period of leave in mid-September 1920 gave me another opportunity, and my efforts were rewarded.

Though not nearly so numerous as *Ixalus variabilis* its voice could be heard on all sides, and especially in gloomy dells, where tree ferns flourished. I found as soon as I approached one too closely he became tongue-tied—something akin to stage fright I suppose—and then the same contest of patience arose between us, at which I had been so badly defeated by the last species, *signatus* proved himself as victorious an opponent as *variabilis*, and I wasted several days in wet surroundings, and was bitten to pieces by mosquitoes, before success crowned my efforts. Then I adopted new tactics. My next manœuvre was to try and locate the little beggar as near as possible, and then go in and boldly shake the foliage, but there is something uncanny about the sound which makes one think at one moment it is at ground level, at another in low foliage, and after again twisting one's head, somewhere at about the level of one's face. My first success was due to sheer luck. I was trying the patience " stunt " with one that I had located in a flower bed but could not see. As I imagined it must be my visible presence that scared the frog, I secreted myself behind the trunk of a convenient tree within six feet from where I judged the sound to have emanated. After a long spell just when I was beginning to think froggie had done me down again, I was startled to hear a call close to my head. I scanned that branch with every care, but failed to see this little wizard of the bush. I then gave the branch a brisk shake and something dropped on to the grass beneath. Was it a dead leaf ? No, it moved. Thank Heaven, it jumped ! Being in the open I had the advantage, and a pretty little brown tree-frog was soon quartered in my match box. With great satisfaction I returned to my dumb-struck friend in the flower bed and started a systematic shaking of every plant, with the result that something jumped out of a *Chrysanthemum halleri*. In half a second I was in the middle of the bed. One second more and I had him. My match box was cautiously opened, and number two with a good deal of persuasion " a posteriori " owing to the limited accommodation within, was securely imprisoned.

So much for the sport, but what of the " kill sports ?" This scene was enacted in Sim's Park, the daily " rendezvous" of multitudes of nursemaids with their charges (every colour variety of both known to India). As soon as I took up my quarters behind the tree I was evidently spotted by one of the lynx-eyed children who communicated the intelligence to others. The result was they jumped to the conclusion that I was playing a game of hide and seek, and they waited at first to ascertain who the children could be who would do the searching part of the business. No seekers arriving, curiosity impelled them to troop in twos and threes past me, not once but many times. Then one of the nursemaids, who had been for many minutes encircled by the stout arm of a "Tommy" in a summer house, was told, and there was a sudden " break away", and both got up and walked backwards and forwards in front of my tree, the Tommy trying to reassure himself that I was not one of his officers doing a spy on him. Then the policeman—usually a fixture at the gate—forsook his post, and peered at me, and appeared very suspicious and haunted my near vicinity. Later on a mali joined the policeman and there was much subdued conversation between them. When, therefore, at the climax I had leapt into the flower bed, and had captured my specimen, I found myself surrounded by all the " kill sports ", and was in too

small a minority to attempt to repudiate being the cause of the damage done to certain plants that was pointed out by the incensed mali to the policeman. Moments like this cause me much distress!

Of course the malis in Sim's Park are quite accustomed to small boys and girls jumping into the flower beds, and a very rich torrent of vernacular abuse they have at their command whenever they catch any of these little folk doing it, but when one of the same malis finds a grizzle-headed, apparently sober, quinquegenarian indulging in the same juvenile frolics, his indignation is such that his jaws lock and his lips refuse to function. My hostile environment left me no choice but to withdraw with as much nonchalance as I could assume. But I am not good at this sort of thing,and find I cannot retire with any dignity on such occasions. I never had any training for the stage. It is one thing to search for a frog, but to find oneself—the pursuer—also being pursued and tracked down by an uncouth specimen of *Homo pithecops* variety *nilgiriensis*—in other words a hill cooly—is most humiliating. On my way home in my rickshaw I decided there was nothing for it but to place Sim's Park out of bounds for myself. I was decidedly unpopular among the officials there. People who read Natural History books have no idea at what cost the knowledge they contain has been acquired. Somebody has got to act as I do, or no Natural History books would be written.

On my return to the Hotel my captives were placed in a salt jar and provided with foliage and water and I awaited developments. Each frog took up his seat in the middle of a leaf, and indulged in those silent gargling efforts peculiar to batrachians in general. At dusk suddenly one tuned up, I heard his tinkling cadence, and saw his vocal sac expanded to the full, and it was no small satisfaction to realise that I had solved the authorship of the notes that were so familiar to me.

The call of this species is polysyllabic, and repeated from five to ten times at the rate of about twice a second. The notes are "staccato" and uttered with a slight tendency to "crescendo". In quality they remind one of the sound produced by castanets and there is a slight musical ring not heard in the note of *variabilis*. The notes commence when the vocal sac is almost at its maximum distension.

Ixalus glandulosus.

I obtained one specimen of this species which I dislodged from beneath a log at dusk on Adderley estate at about 4,500 feet elevation.

There is another polysyllabic note one can distinguish among the babel of batrachian voices which probably emanates from another *Ixalus*, perhaps this one but which I failed to trace to its origin. It is not so frequently heard as the call of *signatus*. The notes are numerous and more rapidly uttered than those emitted by *signatus*, and I hope to make the acquaintance of my unknown friend on my next visit to Coonoor.

Micrixalus opisthorhodus.—The Pink-legged Frog.

A very pretty little batrachian is this species which is even more diminutive than *Ixalus variabilis*. Its most striking feature is the rosy colouration of the backs of the thighs and the abdomen. It is fairly abundant at about 6,000 feet, but not nearly so common as the *Ixalus* just referred to. I found one hopping about in the leaves in a dense jungle beyond Lamb's Rock. I failed to hear its vocal effort, and the elucidation of this must be left till another visit.

Genus Rana.

Rana limnocharis.—The Yellow-legged Frog.

This species common enough in the plains is also quite common at the altitude of Coonoor, and is the prevailing species found in the ornamental piece of water in Sim's Park. In June it was very clamourous and evidently taking

matrimonial matters very seriously. The back of the belly and thighs are suffused with yellow. It is very frequently victimised by the snake *Nerodia piscator*, less frequently by *Amphiesma beddomei* and *A. monticola*.

Rana temporalis.

An elegant frog that few people ever see owing to its shy and solitary nature is *Rana temporalis*, a species that grows to about three inches in length. It is not uncommon at about 6,000 feet. It is a beautiful uniform rich brown dorsally, and the delicate smoothness of its skin rivals that of the most beautiful calf bound volume the trade can produce There is a dark band before and behind the eye, and dark bands on the limbs. The belly is white with some speckling of brown on the throat and breast.

Those I have tracked into their lairs were solitary, and had established themselves in some dark recess beside a mountain stream or trickle in some quiet glen, the favoured haunt of the mosquito, and the tree fern. Nobody would suspect its presence there if it remained silent. However in the rains, like other batrachians its thoughts tend towards the subtlest of passions. Stirred by unusual emotions its feelings give vent to a vocal effort intended for his lady love, but which also proclaims the presence of the frog to the attentive ear of the naturalist. I heard its unmusical note many times before I discovered the species responsible for it. As with other batrachians I found I could approach to perhaps three yards of it by an extremely cautious advance, and then it suddenly became as speechless as a Scotch Planter after a Masonic dinner. I had many trials of patience with the unknown, but failed miserably in these contests. The fact is on these occasions all is in favour of the quarry. He sits in the water or beside the water in some dark recess, and croaks words of love to his prospective bride. A huge beast in human form hears a mysterious batrachian sound and seeks to learn the author. Moving at a snail's pace the human beast—on this occasion me—gradually arrives at a certain proximity from whence the frog has him in full view. At this point the frog decides to make no further remarks to his lady love. Then follows that trial of patience which the frog invariably wins. Human nature being what it is in the presence of mosquitoes the time comes when immobility is no longer possible. The human beast at last flinches or brushes aside the mosquitoes on his hands or face, and all the previous period of statue-like patience is wasted, and the struggle commences afresh. After many days of fruitless endeavour the human beast resolved to try bold tactics such as are so successful in the capture of the feminine heart. Thus determined I went off one day to Sim's Park, the scene of so many previous frog adventures. This was before I had placed it out of bounds for myself. It is a beauty spot in the middle of the most beautiful of all Hill Stations. Here one finds all the trees and plants named, and can improve one's knowledge of botany. There are garden seats too where one can sit in comfort after one's latest defeat at the hands of a frog, smoke a cigarette and think matters out. My steps were directed to that same little glen below the miniature lake, where the light is dim and water tinkles melodiously, and tree ferns wave, where glade-loving butterflies such as *Ypthimas* and *Lethes* rise under one's feet, and flit jauntily away into still deeper gloom, and where I knew one of my unknown frogs lived. He had defeated me so often that I had an intense desire to get level with him. I listened. Yes : he was there in the usual place. Without further delay I rushed into his lair-splash, splash, clatter, clatter in the bed of the trickle, actively probing with my stick into one dark recess after another. Out came the skulker thoroughly alarmed, with one jump, and then another. I literally fell upon him, and the intelligence that he had not escaped was communicated to me through the cutaneous nerves beneath my waistcoat. He was butting into me, as a hungry kid butts into the udder of its mother. Still lying prone upon my face I passed my hand beneath me, sought for, found, and closed it upon the struggling prisoner. Froggie had played his last trick and lost. Brother naturalist ! If this manœuvre is done

circumspectly, and you have your heart in the job, and your eyes are sharp, and your feet are nimble, and you do not mind getting wet, and there are not too many thorns to hold you back, and there is not a pool handy into which froggie can dive, and a few other "ifs" the batrachian ought to be yours. I have repeated the performance and know. Of course I got a bit wet and muddy during this adventure and its extraordinary when one comes home like that how every lady in the Hotel is sure to be sitting outside, and girls do ask such silly questions. I find it difficult to know how to clothe on these excursions. If one goes out dressed for the sport, the shabbiness and dirtiness of one's attire excites attention on the outward journey. On the other hand if decently attired after an affair such as that just narrated, the condition of one's clothes provokes attention on the homeward journey.

There was a peculiar satisfaction in getting this frog, because he had defeated me so many times previously, and he had contributed in no small measure to my unpopularity among the officials in Sim's Park.

Fortunately the sport of hunting frogs is not like international yachting or polo. No matter what has happened in previous contests, the last is the one and only one that really matters. The winner of this wins the rubber outright.

The voice of this frog is a subdued, harsh, monosyllabic croak, and having heard it one cannot help feeling that Mrs. *Rana temporalis* must be a very dull person to be charmed by any thing so uninteresting. The best feature of the declaration of love is its brevity.

Genus Bufo.

Bufo melanostictus.—The Common Indian Toad.

This species is as common in the Nilgiris Hills at the altitude of Coonoor as it is in the plains, and occurs abundantly even up to the level of Ootacamund. I found it breeding in the ornamental water in the Botanical Gardens at that station. The young were hopping about all over the gardens in July I think, though I have omitted to note the exact date. It makes a short, monosyllabic hiss when provoked.

This forms the staple food of the snake, *Macropisthodon plumbicolor*, a species that is abundant up to the altitude of Ootacamund.

Bufo beddomei.—Beddome's Toad.

A toad identified with some doubt as this species was captured by me on Adderley Estate at about 4.500 feet. This specimen was adorned with carmine spots and blotches on the sides of the body, and on the front of the forelimbs, as are some specimens of the last toad.

When the "Fauna Reptilia and Batrachia" appeared in 1890, it had only been recorded from the Travancore Hills, and this fact alone makes me query the correctness of my identification.

Icthyophis glutinosus.

This cæcilian is fairly common in the Wynad. It appears to subsist entirely on earthworms. I removed one from the stomach of one specimen, and found the intestine of others loaded with semiliquid mud evidently derived from this form of diet.

BUTTERFLY COLLECTING IN INDIA.

By

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(*With 9 Text Figures.*)

1. I do not think that anyone, who has taken the trouble to look, can fail to be impressed by the splendour of the butterflies of India. There are many, who would like to study them further, but very few proceed beyond mere admiration, chiefly because of the difficulties involved in following a pursuit without a guide. It is the purpose of this article to draw attention to the variety of interests that underlie the hobby of butterfly collecting and to explain how these beautiful insects may be captured and preserved. I think it was A. R. Wallace who wrote somewhere that the story of evolution is written on the wings of butterflies and I believe that, when the study of zoology can be correlated with the studies of geology, geography and botany by a superman of the calibre of Darwin, the mystery of evolution will be solved. Before the solution can possibly be reached, and it will not be in our generation, a mass of observation work has to be done. The professional zoologist ignores the butterflies and devotes himself either to the lesser known groups or to such as have a definite economic value; he admittedly leaves butterflies to the amateur and so here is a field in which the amateur, who happens to be an observant student of nature, can help on the attainment of knowledge.

2. The Indian Empire, wherein for zoological purposes are included Ceylon and Burma, is probably the most ideal country in the world for pursuing the study of butterflies. It offers the extremes of heat and cold, of dampness and dryness, of desert and rank jungle, islands and continental areas, an ever-varying vegetation and in many parts sharply marked seasons, while its geological history is most interesting. For faunistic purposes the world is divided into the American, African, Palæarctic and Oriental regions. With the American region we are not concerned. With the African region we have a connecting link through Baluchistan, but in former years the connection must have been a much more important one, since there are a number of genera which we share with Africa. The Palæarctic region comprises Europe, the Mediterranean littoral of Africa, Western and Northern Asia. As far as we are concerned this region is divided into the European sub-region, which embraces Western Asia and reaches us through Baluchistan; the Central Asian sub-region, reaching Chitral and to a less extent the N. W. Himalayas; the Chinese sub-region, which enters the Indian empire between Sikkim and Northern Burma. The Oriental region comprises the Australian and the Indo-Malayan sub-regions and the latter is divisable into the South Indian (including Ceylon) and the Malayan, covering all Lower Burma; it must be remembered that the mighty Himalayas are mere children on the face of the globe and only possess a bastard fauna made up of immigrants from other far older areas. The Indian area, as defined at the beginning of this paragraph, can be divided for convenience into the following reasonably well defined sub-areas:—

A. Ceylon, closely allied to South India, but, being an island, it has a number of forms peculiar to itself.

B. South India, embracing the Madras and Bombay presidencies, excluding Sind, but stretching up into the Central Provinces and Bengal.

C. Baluchistan and Sind (more or less), possessing an almost entirely Palæarctic fauna and showing little or no connection with the fauna proper of India.

D. Chitral and Ladak, with a Central Asian fauna more or less modified to suit local conditions ; the high elevation species extend right along the Himalayas to Sikkim.

E. The Western Himalayas from Kashmir to Kumaon, with a bastard fauna made up of species that have found their way there from the Central Asian, Chinese and South Indian sub-regions, many of which have been modified so as to constitute well defined races or even species.

F. The North East corner of the Empire, running from Sikkim to Northern Burma (Shan States). This is one of the most interesting areas in the world. The Central Asian, Chinese, Malayan and South Indian sub-regions have found a most fertile meeting place here; it is also more or less of a country in the making and in a number of genera variation seems to have run riot.

G. Lower Burma from the Karen Hills to Victoria Point, containing a slightly modified Malayan fauna, while in the extreme South many purely Malayan forms are to be met with.

H. The Andamans and Nicobars, which have a fauna made up of modified Malayan forms, but displaying a very distinct affinity with South India.

The above sub-areas can no doubt be divided still further, but greater detail need not be entered into here. It will be seen that the Plains of North India have not been dealt with in the above list ; they have no characteristic fauna of their own and the few species that are to be met with are all members of one or other of the recognised sub-areas.

3. Butterflies differ from moths in a number of ways, but no hard and fast line can be laid down. The chief distinguishing characters are ;

a. Butterflies for the most part fly by day ; they never fly at night, but a few species remain dormant until the dusk.

b. They have as a rule knobbed or hooked antennæ, which are straight and are held in front of the head.

c. Most butterflies rest with the wings erect.

d. The upper and lower wing on one side of the body are never joined at the base.

The species of butterflies are divided into a number of families, sub-families and genera depending on their structure, into the details of which we need not enter here. The Indian butterflies have not up to the present been given English names, though every school in the hills has assigned to the more conspicuous species found in the immediate neighbourhood fancy names of sorts. Scientifically a butterfly is recognised by two names, that of the genus being followed by that of the species ; for instance *Papilio machaon* is the ordinary English swallowtail. Butterflies that occur over a large area are apt to develop into a number of well defined races and in order to distinguish them a tri-nominal system of nomenclature has been adopted ; for instance *Papilio machaon* is the European race of the common yellow swallowtail, *Papilio machaon asiatica* is the Western Himalayan race, *Papilio machaon sikkimensis* the Chumbi Valley race and so on. If it is desired to distinguish a variety, the abbreviation v. is put before the varietal name ; for instance *Papilio machaon asiatica* v. *ladakensis* is the short-tailed variety of the common yellow swallowtail found in the Western Himalayas. If the variety is confined to only one sex, the sex sign ♂ for male and ♀ for female is put before the v.

4. For the purpose of this article the main divisions into which the butterflies, or scientifically the *Rhopalocera*, are divided may be briefly described as follows ;

A. Danaids. Large, tough, insects which contain nasty juices and can emit evil odours at will, whereby they are rendered distasteful to their enemies. Two tawny and one blue and black species of the genus *Danais* and one white spotted dark velvet brown species of the genus *Euplœa* are

to be found lazily flitting about every garden in the plains. In N. E. India and Burma many of the Euploeas are shot with a most splendid iridescent blue colour. A third genus (*Hestia*) containing very large black-spotted diaphanous butterflies is to be found near the coast in Ceylon and South India and in the mangrove swamps of Burma.

B. Satyrids or "Browns". As a rule the members of this somewhat numerous group prefer the shade and are most often to be seen flitting about in jungle; a few species patronise rocky slopes. They are mostly sober coloured insects with rings or eyes on the wings and in England are known as meadow-browns, heaths, walls, ringlets, etc. They vary in size from the tiny *Ypthima* to the very large *Neorina* of N. E. India.

C. Morphids. This group attains its greatest development in South America whence come those wonderful metallic blue insects one sees in the shop windows of Regent Street mounted as ornaments. They are only found in or on the edge of thick jungle and do not fly much by day unless beaten up. Nearly all the species are very large and, though our Indian forms do not equal the S. American ones in splendour, yet they have nothing to be ashamed of.

D. Nymphalids. These are the true sun lovers amongst butterflies and the group contains a large number of handsome species. The well known "Painted lady" can be taken as their universal representative, but the diversity of forms is extraordinary. Some of them, the genus *Charaxes* for example, have very large and strong bodies and can fly like birds; others, such as the delicate "Map butterfly" sail gracefully in the sunshine. The wonderful "Leaf butterfly", the white and red "Admirals", the "Tortoises", the "Purple emperor" and the "Fritillaries" are all members of this group. We all know the merry little bright blue and yellow *Junonias* that flit about just in front of us along our bungalow paths, also the large *Hypolimnas* with blue-ringed white circles that often appears in swarms shortly after the break in the rains.

E. Papilionids or Swallowtails. Many of them have no tails and are mistaken for members of the preceding groups; however a glance at the legs settles the point at once; in this and the following groups the forelegs are as long as the others, while in the preceding groups the forelegs are short and quite useless for walking. There are many magnificent swallowtails in India and they can vie in beauty and diversity with their cousins in any other part of the globe. In the South and North East and in Burma there fly the *Ornithoptera*, great black insects with brilliant yellow hind wings, which fly slowly far out of reach at the tops of trees. Then there is the wonderful black swallowtail with a peacock-green hindwing found in the hills, and the delicate white, black striped, swallowtail of the Himalayas. In the family are included a few species belonging to genera other than the true *Papilio*. There is the *Armandia*, a truly magnificent butterfly from Bhutan, the Naga and Chin Hills, a many-tailed creature with a large red area on the hind wing. The *Teinopalpus*, a wonderful green and yellow butterfly, that is to be found on Tiger Hill, Darjiling, and in the hills of Assam and North Burma. The *Leptocircus*, a small and very curious looking insect, which has enormously long tails and presents a striking resemblance to a dragonfly. Finally the *Parnassius* or "Apollo" butterflies, inhabitants of the highest Himalayas; beautiful white insects with black, red or blue spots.

F. Pierids, or "Whites". The majority are white, such as the well known "Cabbage white", but many are yellow and a few are even red or blue. There are the "Brimstones", "Clouded--yellows" and "Orange tips". The most characteristic Indian representatives are perhaps the members of the genus *Catopsilia*, large greenish white insects, and the small yellow

Terias, several species of which swarm in every garden. The most variegated species belong to the genus *Delias*, the plains member of which is a white insect with large red spots along the edge of the hind wing below.

G. Lycænids or "Blues". The most numerous family of all and in many respects the most interesting. When a collector has obtained most of the representatives of the large and handsome members of the preceding groups, he turns his attention to the Lycænids and always regrets that he did not think of them before. The diversity in colour, markings and shape is greater than in any of the preceding groups. The Lycænids are divisible into two main groups, the "weak" and the "strong" or the true "blues" and the "hairstreaks". Amongst the "hairstreaks" are to be found the most brilliant metallic blues, greens and brassy tints. In many species the tails are very long and in others short and thread-like.

H. Hesperids or "Skippers". This group differs greatly from those that have preceded it. They are mostly small, rather dull coloured, insects, with large heads and bodies and a very rapid flight. Some of the species are crepuscular, while others delight in the sunlight. The group is not so well known as the rest, but the advanced entomologist finds that it presents features of the very greatest interest. The accumulation of a great deal of more material is needed to enable the group to be worked out properly.

5. Below is a table, which shows how the various groups are distributed amongst the sub-areas detailed in para. 2. The total given in the last column are for the actual species known; many of these species have developed into more or less well defined races according to the areas they occupy and the modern tendency is to name more races as more material becomes available.

Group.	Ceylon.	South India.	Baluchistan. Sind.	Chitral. Ladak.	N. W. Himalayas.	N. E. India. N. Burma.	S. Burma.	Andamans. Nicobars.	Total.
Danaids	11	11	1	3	7	18	28	18	37
Satyrids	16	28	10	17	51	117	57	8	189
Morphids ..	1	3	..	..	..	17	16	2	20
Nymphalids ..	38	49	6	30	88	180	145	33	247
Papilionids ..	15	19	4	10	25	68	49	11	91
Plerids	30	36	19	18	39	51	36	17	83
Lycænids ..	72	86	14	44	80	237	233	61	470
Hesperids ..	4	78	7	13	58	198	154	33	278
Totals ..	229	310	61	135	348	885	718	143	1,415

With the Nymphalids are included two minor groups, which are closely allied *viz.*, the *Libythacinæ* and the *Nemeobiidæ*.

6. As no doubt everyone knows, a butterfly has passed through the stages of egg, caterpillar and chrysalis. The study of the early stages of the butterflies of India has with two brilliant exceptions been most woefully neglected. The first of these is Mr. T. R. Bell, the author of the papers now appearing in the Journal entitled "Common Butterflies of the Plains"; he has discovered the life history of practically every butterfly that inhabits the North Kanara District of the Bombay Presidency; as a matter of interest I may mention that in at least one case Mr. Bell has reared a butterfly that has never yet been found flying. The second is the late Mr. P. W. Mackinnon, who in Vol. XI of the Journal described the life history of most of the butterflies of Mussoorie. Every fully developed living organism is said to climb up its genealogical tree before it attains maturity, so that the importance of studying the early stages can hardly be over estimated; our classification still presents many imperfections, which will not be removed until a great deal more has been discovered regarding the early stages. Breeding butterflies is a rather troublesome business and necessitates continued residence in one place; the opportunities afforded the ordinary official are somewhat limited and it is chiefly to the planter or the retired individual that we must look for assistance. The great desiderata are observers in the Darjiling district and in Assam and Burma, more especially the rubber planters or tin miners of Mergui and Tavoy. Many years ago a distinguished American naturalist, who spent some time collecting butterflies in India, evolved a classification for the skippers based on the eggs, but lack of material rendered it unreliable. Under a microscope of moderate power the eggs are wonderful things. The caterpillars are of many different forms and colours, while the chrysales are often most curious and are concealed in a marvellous manner. I will not enlarge on this subject, but will refer those interested to Mr. Bell's articles, than which nothing better has ever been published. A study of the food plants in various localities with notes as to how they differ would be most valuable information towards affording an explanation of the geographical variation of butterflies.

7. The investigation of the structure of the perfect insect can safely be left to the cabinet naturalist, but it is only the field naturalist who can supply information regarding the habits of butterflies. There are numerous points to be noted. Males are often to be found playing about in the sun or sucking moisture in damp spots. The female attends more strictly to her business of egg laying and requires watching as to where she lays her eggs, whether singly or in clutches, on what particular food plant and whereabouts on it. Caterpillars can sometimes be seen feeding openly, but for most of them a very close examination is needed; many are night feeders; a good plan is to beat bushes and with luck the caterpillars will fall into a net held below. The caterpillar passes through various moults and requires examination at every stage. The act of turning into a chrysalis demands close observation and the manner in which the chrysalis reposes; some hang free from a twig, others are secured by a girdle, while some remain like a grub inside a fruit. The actual emergence of the butterfly is a sight rarely seen but very well worth watching. The habits of the actual butterfly require much observation; the season of emergence, number of broods in the year, duration of life, mode of flight, nature of habitat and so on all require recording. There is no end to what can be done and all of it is interesting. There seems to be a very general impression that the life of a butterfly is limited to one day; if an enemy secures it on the day it emerges, then all is over, but many survive for very long periods; for instance in the Himalayas nearly all the butterflies one sees in the spring emerged in the Autumn and have lived through the winter, coming out very often for a flight on a warm day; in Japan there is a species that emerges in July and flies till the following May.

8. If a butterfly flaps about in a lazy fashion, it is probably more immune from dangers than those that have a rapid flight or seek cover rapidly. This brings us to the interesting subject of mimicry and in India we have some of the most striking examples in the world. Now the Danaids are probably the most highly protected family and we find that the female of a common Satyrid and a Nymphalid resemble a certain common Danaid almost exactly, though the males in each case are totally different. Again among the swallowtails the red-bodied group are highly offensive and we find that certain females of the black-bodied group resemble them exactly except for the colour of the bodies. Again among the *Euplœa* genus of the distasteful Danaid family there is a marvellously close resemblance between species inhabiting the same area ; in South India for instance the only three members of the genus are so alike that somewhat of an expert is required to distinguish between them. The reason for this latter form of so-called mimicry is stated to be that the young enemy has to learn by sad experience what is distasteful and what is palatable ; so he starts by sampling everything that comes along and soon learns to distinguish the nasty from the tasty ; thus the nasty group are likely to lose fewer individuals if they present the same general appearance to the former. For the same reason it is an advantage for a distasteful butterfly to be coloured conspicuously ; it is thus able to warn the enemy that it should be left alone.

9. The observer will soon notice that a large number of butterflies, more particularly the inhabitants of jungles or undergrowth, are marked in a peculiarly cryptic fashion on the underside and that, when at rest, they are so assimilated to their surroundings as to be practically invisible. Many of them are wonderfully coloured above and cannot fail to attract attention but, when they alight, they seem to disappear. The famous " Leaf " butterfly can be cited as one of the most striking examples ; the upperside bears a broad yellow or blue band, while the underside almost exactly resembles a dried leaf. The tails of a butterfly are considered to be an important life saving device and certainly they do not seem to be much use for anything else : the hind wings project well beyond the body and just before the tail there is an eye ; the idea is that the enemy thinks that the hinder end is the head with the prominent eyes and that the tails are the antennæ ; he makes his dart, but the butterfly flies cheerfully away minus his tails the loss of which do not worry him at all, but of course he will not escape so easily again. Several theories have been propounded to explain the mystery of mimicry ; to me the whole subject remains an absolute mystery and I can safely assert that a great deal more observation work is needed before anyone can produce a theory that will convince the man in the street. I cannot believe that a butterfly has been able to perfect the art of camouflage, as he undoubtedly has done, by means of his own unaided intelligence.

10. Bound up with mimicry is the question as to what are the enemies of butterflies and here again much observation is needed. I think that the principal enemies are lizards, as far as the butterfly is concerned, but there are undoubtedly many others. I have seen a kingcrow making a good meal off butterflies on the wing, and a bush containing a praying mantis is often marked by numerous butterfly wings strewn below it. In the earlier stages the enemies are probably much more numerous, and birds in particular eat the caterpillars very freely ; many of us as schoolboys have been bitterly disappointed to find an ichneumon fly emerge from a chrysalis we have carefully reared.

11. Butterflies share with all other living beings the strong natural tendency to enlarge their sphere of action, but certain species are known to indulge in the most extensive migrations. Certain Pierids (the Catopsilias) are in India the most persistent emigrants. They can sometimes be seen in great herds treking in a straight line over hills and plains at a pretty constant speed. Certain other species often join in the migrations. A common blue (*Lampides*

bœticus) migrates in the Spring. In March at Rawalpindi I have observed this species migrating for several weeks; across a width of 20 yards I counted 90 per minute passing during the period of greatest intensity; throughout the whole period the direction was 5 degrees North of West. Again and again I have noticed butterflies flying in a definite direction; they may turn aside to a flower or to inspect a passer-by, but they eventually continue on in the same direction. In the Journal of the Entomological Society there have appeared recently some interesting articles dealing with the migrations of certain Pierids in the Island of Trinidad; the butterflies apparently started at the South end of the island, travelled direct to the North end, then turned West, leaving the island eventually in this direction for the mainland of America. The density of these migrations were so great that motor cars had to stop moving on the roads, since nothing could be seen through the wind screens.

12. I should now like to touch lightly on the subject of variation, regarding which much has been written, but there is no doubt that theory still predominates over proved facts. The whole subject is most fascinating and, as I said at the commencement of this article, not only do butterflies offer the best medium for its study but also that we are better situated for the purpose in India than anywhere else in the world. There are four kinds of variation to be thought of; sexual, individual, seasonal and geographical. Sexual variation can be dealt with very briefly. In many species the two sexes are almost indistinguishable; in the majority there is a marked difference; in a few there is no resemblance whatever between the sexes and it is only comparatively recently that they have been ascertained to belong to the same species. Among the nasty groups the resemblance between the sexes is pretty close and this is also the case more or less amongst the group with cryptic undersides. In the unprotected groups there is usually a considerable difference; it is the female that is always duller and less conspicuous than the male, while in certain genera the differences between the males of the various species is considerable, but the females are so alike as to require a first class expert to allocate them to their correct males. It is no doubt the object of Nature to preserve the life of the female for a longer period than the male, since after fertilisation she has to devote her time to laying her eggs. Possibly Nature's intention is that the bright coloured males in the unprotected groups should be sacrificed to the enemy, so that the insignificant females are preserved.

13. Individual variation may arise from a number of causes; different nutrition in the caterpillar stage, effect of light or temperature on the chrysalis, are probably the most important, but there are no doubt others that we do not even suspect at present. In some species the variation is extraordinary; for instance the undersides of no two leaf butterflies are alike. Again in the little yellow Pierid (*Terias*) of the Indian garden the variation between individuals is tremendous. In many butterflies the variation is very small, but a minute examination will show that no two individuals are exactly alike any more than are two human beings. All the varieties of this class can be more or less linked together by intergradations, provided one can obtain a long enough series. There is, however, another class or individual variation, where very distinct varieties occur that cannot be linked together; this kind of variation is called dimorphism. For instance a few species of Papilionids exist in two totally different forms in both sexes. Two other Papilionids each have three totally different forms of females. In one of these, the black-bodied *Papilio polytes*, the first form of female resembles the male and is comparatively rare; the second resembles a rusty red-bodied swallowtail, which only occurs in the peninsular portion of India, where alone this form of female is to be found though the species is met with nearly everywhere; the third and commonest form is like another red bodied swallowtail found everywhere. There is yet another kind of individual variation known as an aberration or sport; these are rare but occur in some

species more than in others ; they are usually very different to the parent form. This class of variation has attracted a great deal of interest of late years and forms more or less the basis of the theory known as Mendelism, which by experiments on domesticated animals and plants has been proved to be a law and no mere theory. It is supposed by some authorities that it is these sports that give rise to new species in Nature.

14. Seasonal variation, as one might expect, is most marked in Indian butterflies. In any species that has two or more broods during the year, differences to a greater or less degree are to be found between the broods and, as a rule, the greater the local difference of season, the more apparent the influence on the wings of the butterfly. In some of the Satyrids the differences between the undersides of the two seasonal forms is startling and for many years they were regarded as different species : in the instances to which I am referring locality does not appear to affect the intensity of the dimorphism. In the dry season form the underside exactly resembles a dried leaf, while in the wet season form the underside is evenly striated and bears a row of eyes along the border. The reasons for seasonal variation are probably to be ascertained by a close investigation of the caterpillar stage and perhaps are due to the seasonal variation in the food plant ; in some species it is possible that the characteristic has been inherited from bygone days and still remains though the original causes have disappeared.

15. Geographical variation presents a most interesting field for investigation and it is not unlikely that in geographical variation combined with Mendelism will be found the solution to the formation of species. As pointed out in para. 11 Nature is always urging a species to enlarge its sphere of action and, if a species spreads to a district which differs in climate or other particulars from its original home, it may, if it is a decadent species fail to establish itself, but if it can contend with the change in the caterpillar food, the new enemies to be encountered with and the new climatic conditions, it will form a new colony. The different conditions may soon have an influence on the appearance, habits, etc. of the butterfly and a definite, easily distinguished, geographical race may become established. If the species is given to produce aberrations or become so by reason of the new conditions, as is quite probable, the sport, which is a recessive under Mendel's law in the original home may become the dominant and, gradually swamping the normal form, establish a new species. If the habitat of the parent species and of the colonists is not separated by an impassable barrier, such as plains in the case of hill species or hills in the case of plains species or desert or sea, it is quite likely that the races will remain closely allied and can be graded in a long series. If, however, a barrier exists or becomes formed by geological changes, the two races will gradually become more and more different as the centuries roll on, and should the changes in the earth surface ever bring them together again, they may be unable to interbreed and therefore must be regarded as species. Increase in elevation appears to have a considerable effect and I am not at all sure whether certain closely allied so-called species, found at different elevations, are not really conspecific, a certain feature being dominant in one area and recessive in another. Some of the inhabitants of the Himalayas differ on every watershed or in every large valley. There is a certain large Papilionid, *memnon* by name, that presents several remarkable features, not the least of which is that it possesses three forms of female, one of which is tailed, while the male and the other two females are tailless. Now in South India and Ceylon there flies an allied species called *polymnestor*, where the sexes are nearly alike, but are widely different from *memnon*, in that they bear a broad pale blue band above. Now *memnon* and *polymnestor* meet in the lowlands of Sikkim, but do not appear to trespass on each other's boundaries ; yet certain known aberrations of *memnon* show a marked resemblance to *polymnestor*. I would not be at all surprised to hear that they were conspecific and that each is the dominant in

its own area but the recessive in its neighbour's. In Nature it would seem that the recessive always becomes swamped by the dominant, unless it gets its chance under changed conditions, which are more favourable to the recessive than to the dominant. Breeding experiments on these lines might reveal all kinds of secrets. While speaking of the butterflies *memnon* and *polymnestor*, an interesting fact may be mentioned regarding the Andaman representative ; the male shows a much closer resemblance to *polymnestor* than to *memnon* and is tailless, while the female appears to be a totally different insect and is almost exactly like the tailed female of *memnon*.

16. There are one or two other characteristics displayed by butterflies that I would like to draw attention to, as showing what an interesting subject their study can be. Butterflies possess peculiar instincts, regarding which we know very little. The latest theory regarding their eyesight is that not only do they fail to distinguish objects at a range exceeding twelve inches, but that they are also totally colour blind. Yet a butterfly can fly at a great pace unerringly through the closest jungle and appears to be able to distinguish his mate at great distances (the English " drinker moth " can, I understand, locate a female at a range exceeding a mile) : he can locate flowers with apparently no scent quite easily and return to the same bit of carrion the next day, if he is so inclined ; the female in selecting the correct food plant for her eggs proves herself to be a botanist of no mean calibre. Whatever a butterfly's eyesight may be, there is no doubt that he can spot at once the least movement that is out of the ordinary, as the collector will soon notice when stalking a wary species.

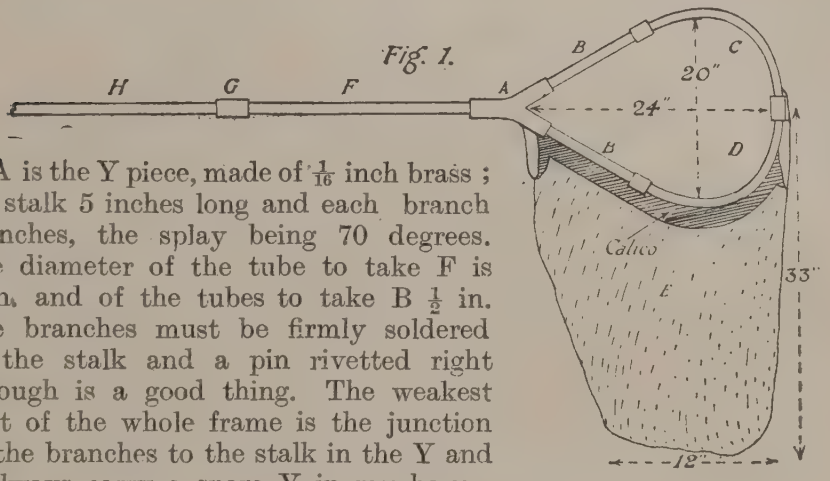
17. Many males display certain extraordinary features, known as secondary sexual characters ; some have brands of specialised scales on the wings, others pouches and again others recumbent or erectile tufts of hairs ; some species have a profusion of these features. In the Danaids the male can protrude long pencils of hairs from the end of its body. The functions of these characters are not understood and will only be solved by close observation work. Some butterflies, notably amongst the Morphids, emit a pleasing scent resembling vanilla, which remains for a long time after death. The primary sexual characters of the male are most extraordinary and have received a great deal of attention in recent years ; their structure has in many cases proved of the very greatest importance in classification, while in certain very closely allied species, an investigation of the genitalia is needed, before they can be accurately determined. Another curious characteristic is that displayed by the caterpillars of certain Lycænids ; they are attended by various species of ants, who in return for being allowed to suck the juices exuded from certain glands, look after the caterpillar and protect it from its enemies ; the habit has got so strong that the caterpillar cannot live without its particular species of ant being there to protect it.

18. The foregoing paragraphs have been written with the idea of showing those who have taken a superficial interest in the butterflies of India, that the pursuit of butterfly collecting in real earnest contains many fascinating avenues to be explored ; I may say that I have only touched on the fringe of the whole subject. The first desideratum, however, is the making of a collection, so that the species may be identified and the knowledge already accumulated rendered intelligible. We should never get any forrarder, if we all had to start where Adam did. There are no real difficulties about making a collection and with ordinary care its preservation is moderately simple.

19. The best kind of net is of the form shown in the sketch. I have tried many patterns and speak with some experience. The net is a strong one and can be used for beating bushes. It is an article of store, known as the " Balloon Net ", and can be obtained from Watkins and Doncaster, 36 Strand, London W. C., or from the Army and Navy Stores, Bombay or Calcutta. Any decent

bazaar mistri could turn out the frame, if given the drawing and the description, while any dirzi could make the net. The material for the net is a matter of importance ; it must be soft and any new stuff should be thoroughly soaked to get the starch out; mosquito netting, mull mull, leno are all good and what is known as pineapple silk is better still ; colour is probably of no importance, but green and sometimes khaki is fashionable. Always carry a spare net to replace a torn one.

Fig. 1.



A is the Y piece, made of $\frac{1}{16}$ inch brass ; the stalk 5 inches long and each branch 2 inches, the splay being 70 degrees. The diameter of the tube to take F is $\frac{3}{4}$ in. and of the tubes to take B $\frac{1}{2}$ in. The branches must be firmly soldered to the stalk and a pin rivetted right through is a good thing. The weakest part of the whole frame is the junction of the branches to the stalk in the Y and I always carry a spare Y in my haversack.

B, B. are the base pieces of the frame ; they must be of stiff wood 17 in. long by $\frac{1}{2}$ in. diameter. The A end should be brass capped so as to fit the Y and the other end should have a brass socket so as to take C and D. C, D are the top pieces of the frame, made of cane, $\frac{3}{8}$ in diameter, bent as shown ; C is $18\frac{1}{4}$ in. and D $16\frac{1}{2}$ in. long. C is brass capped one end and socketted the other ; D is socketted both ends. All caps and sockets must be secured by a pin running through the wood.

E. is the net. The top portion is made of strong calico, length all round 66 in. by width 2 in. The dimensions of the net are shown in the drawing. At the Y and at the apex the calico and the net are slit down for a distance of 5 in. the slit being lined with calico ; this is for putting on the frame and I then close the opening with a safety pin.

F is the stick, a stout bamboo 39 in. long by $\frac{7}{8}$ in. diameter.

G is a brass tube 4 in. long by $\frac{3}{4}$ in. diameter. It is fixed on the end of H, the extension stick, and fits on to G, when it is desired to catch butterflies out of ordinary reach.

20. To catch a butterfly, a rapid sideways sweep of the net is probably the best method, followed by a twist of the wrist so that the net is folded over the frame. Before making the sweep, see that you are not going to get the net torn to bits by a thorny bush. Certain butterflies sit very tight on the ground and for them the best method is to flop the net over the butterfly and then quickly hold up the net itself vertical, when the well behaved ones will fly up and the twist of the wrist, as before, will do the rest.

21. Having caught the butterfly the next thing to do is to kill it. I always pinch them and believe it to be the best method. The butterfly should be killed as quickly as possible by getting it into a fold in the net, persuading it to fold its wings over its body and pinching it at the thorax or that part of the body, whence spring the legs ; the Danaids require a great deal of pinching, but delicate

butterflies require only a light touch. A little practice is required to avoid damaging the legs and rubbing the wings, but there is no great difficulty. Another popular method is to use a killing bottle, which must have a very wide mouth and be filled to a depth of half an inch or so with a paste containing cyanide of potassium ; any chemist will supply it. My objection to the killing bottle is that it is a cumbrous thing to carry about and one wants to be lightly equipped when chasing butterflies ; however, the cyanide bottle is used by a number of experts.

22. The treatment of a butterfly after he has been killed depends on what is to be done with it ; that is to say whether the collector means to set it, when he gets in, or to put in an envelope so as to set it at leisure in his old age or to use it as a duplicate to send to his friends. According to the size of the body, rigor mortis sets in quickly or slowly ; a stout Nymphalid will remain in a settable condition for a day or more, but a delicate blue becomes stiff in an hour on a hot dry day. A butterfly that has become stiff can of course be relaxed for setting, but it is always more satisfactory to set it before rigor mortis has set in ; a butterfly that has been set after relaxing has an aggravating tendency in damp weather to revert to the folded position in which rigor mortis set in ; also the danger of breaking off legs is greater and the whole operation of setting is more difficult in the case of a relaxed specimen. Now I have adopted the following method after having tried many others. Having caught the butterfly, I decide whether I will set it that evening or not. If I decide to set it, I pin it and place it in a small cork lined zinc box, the upperside of which I take care to keep damp ; if time is short, owing to there being many good things about, or if my hand is shaky after an exciting chase, I pin it sideways as a temporary measure, but pin it ready for setting when I sit down for a breather. If my box is crowded, I often pin a butter-fly inside my hat, where it keeps damp enough. If I decide not to set, I put it unpinned with its wings folded over its back into a " cocked hat " envelope. The spare envelopes can be carried in one's pockets, but, when filled, they should be put into a cigarette tin, since the friction that may occur in one's pocket is very likely to cause serious damage. Once a butterfly has been killed, I never handle it with my fingers again, if I can help it ; to move him about and to get his wings folded correctly, I use a pair of tweezers with rounded flat ends they can be bought from a Chemist, but the ends usually want filling. A heavy day's catching may result in a bag of as many as 100 butterflies and experience has led me to adopt the above method as the most satisfactory for dealing with large numbers.

23. Setting a butterfly requires a good deal of practice ; don't be slipshod about it ; a well set butterfly looks infinitely nicer than a poorly set one. The old English method was to set on boards like this ; very low on the board with the wings curving down ; it is not a good method and has been abandoned by all museums and good collectors in preference for what is called the continental method. Personally I use a modified continental system, because the correct one involves very deep boxes and consequently more trouble when moving. Still I recommend anyone who is settled to use the correct system. The board is like this ; the depth of the slot being $\frac{3}{4}$ inches ; in my method the depth is $\frac{1}{2}$ inch. Boards can be obtained ready from Watkins and Doncaster or the Army and Navy Stores ; several sizes are required for various sized butterflies ; I recommend the following widths out to out by width of slot ; $12 \times \frac{1}{2}$; $6 \times \frac{1}{3}$; $5 \times \frac{1}{4}$; $3 \times$. $\frac{1}{3}$.

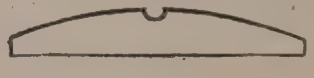


Fig. 2.

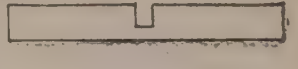


Fig. 3.

Don't leave a setting board out in the open even for a few minutes unattended as ants can do an infinity of damage in no time. They should be put in a tight fitting box or in a meat safe with the legs resting on saucers full of water. I have

made my own setting box, which consists of an ordinary small sized store box, from which I have removed the linoleum lining, cut it into strips and then glued the linoleum to strips of wood which are screwed to wooden fillets and secured by small screws to the bottom of the box ; the soft wood forming the bottom of the box takes a pin well enough. I give here a sketch of it. The top and bottom are not hinged together; so that each half can be manipulated easily. I have found the box most satisfactory and carry it about on all my tours, so as to get fresh set specimens for my collection. The continental pin is white, 1½ inches long and of varying thicknesses ; unless it is made of nickel, it rots pretty soon in India, but nickel pins are rather too pliable to please me. I use black enamelled brass pins of two sizes, both pretty stout ; 1¼ inch long for large butterflies and 1 inch for small ones ; Nos. 4 and 2 Kirby and Beards ; it would probably be better to confine oneself to one size Pins these are best obtained from Watkins and Doncaster.

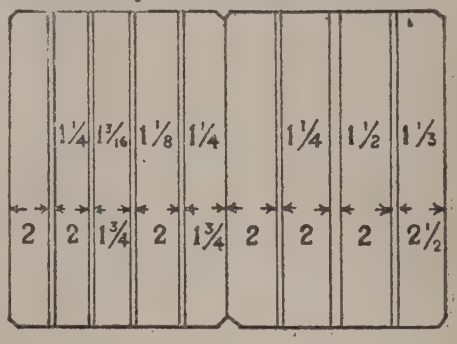


Fig. 4.

Always pin a butterfly thus ; with the pin sloping well Forward. To set the butterfly, pin it to the board, taking care that the slot is wide enough to take the body easily and no more ; with the long legged Papilionids it is a good thing to fold the legs up against the body during setting by means of a strip of cardboard on the pin below the body ; see that the point of junction between the wings and the body is just on a level with the top of the board or a shade above. Then bend down the wings on either side by means of a pin arrangement like this ; A needle is a 6 inches long for large and 4 inches for small butterflies, B is a glass headed pin and C a small cube of cork or linoleum. Then pull forward the wings by means of a setting needle, which should be inserted lightly just behind a vein about the middle of the forward side of the wing ; don't make more holes than you can help and ease the pressure on the glass headed pin as the wings are pulled forward ; the setting needle merely consists of an ordinary fine needle with a blob of sealing wax at the eye end. The sketch shows how far forward the wings should be pulled. Having arranged the antennæ satisfactorily, using temporary pins as necessary, secure the wings by strips of clean paper, of the kind used for the pages of this journal, by means of small pins. Do not be in an hurry to take the butterfly off the setting board ; wait until the body has been stiff for 24 hours ; a large butterfly may take a week to set, while a small blue will not take more than two days. To relax butterflies for setting, use a tin box with several thicknesses of damp blotting paper at the bottom ; place a clean piece of stout writing paper on the blotting paper and put the butter-

Fig. 5.

Fig. 6.

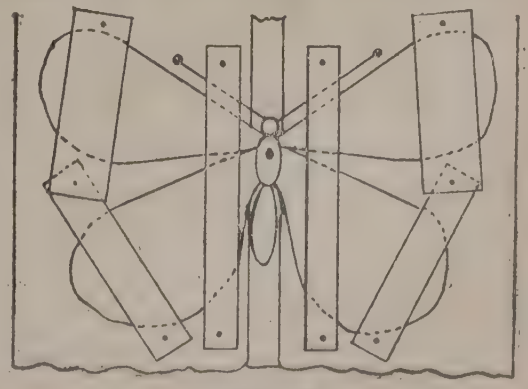


Fig 7.

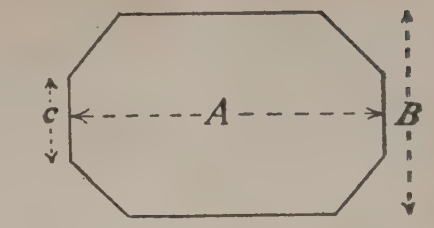
flies on that. Small butterflies take two days to relax, while large ones may take a week, but don't leave them in the relaxing box too long or they will get rotten and mould forms very quickly. Use fresh blotting paper for each batch and after damping it pour a few drops of 1 in 1,000 solution of mercury chloride on to the blotting paper. Never set a butterfly until it is really relaxed and the wings can be bent down easily.

24. To ensure freedom from trouble it is essential to have perfectly fitting store boxes ; the bazaar made article will not do ; for collectors, who are settled, cabinets are to be preferred. I get all my store boxes made by Watkins and Doncaster of three-ply wood, outside dimensions $17\frac{1}{2}$ inches $\times$ 12 $\times$ $2\frac{1}{2}$; they have proved most satisfactory. All one's labours may be lost in a short space, if poorly made boxes are used. I float the boxes in a 1 in 1,000 solution of mercury chloride and see that the special cell is always filled with powdered napthalene. In the monsoon I put a small sponge dipped in creosote at the end of a pin in each box to keep off mould, but in very damp climates, such as Rangoon, it is as well to keep the store boxes in a tin lined airtight case, with a calcium drier put in every now and then. The butterflies should be arranged in accordance with some recognised order in rows at right angles to the long side of the box and each butterfly should have a small label on the pin below the body, recording the exact locality, elevation, if in the hills, and the date of capture ; I use a small triangular card, thus; so that the label can be read without lifting up the butterfly. If a body, leg or antenna comes off, replace by means of shellac solution in methylated spirit, of a viscous consistency, but be quite sure that it belongs to that particular insect ; if it does not, dreadful trouble may ensue when a cabinet naturalist comes to make a detailed examination. The pins holding the butterflies should not be handled except with special pin tweezers which can be obtained from Watkins and Doncaster and the A. and N. Stores. I always ram a pin down as hard as I can into the linoleum lining of the box with these tweezers so that the butterfly cannot get loose, when travelling, and in the case of very heavy bodies, as in the Ornithoptera Papilionids, I cross pin them over, so that, if they do get loose, they cannot shake about in the box and ruin everything. For convenience of keeping the store boxes, I use cabinets of threeply wood, made for me by Williamson, Magor and Co. of Calcutta ; each cabinet takes 12 boxes, each on a shelf of its own and there is a well fitting sliding front. For travelling I use threeply wood packing cases of such a size that the cabinet is everywhere separated from the packing case by a space of $1\frac{1}{2}$ inches and the intervening space is filled with carpets or clothes. I have taken these boxes about India by passenger train for some years and have so far suffered no loss. If mould appears, brush it off with a fine paint brush and then dip the butterfly bodily into a bath of pure petrol or rectified benzine. For butterflies set from a relaxing box that insist on springing their wings, whenever the weather is damp, apply a little shellac from the tip of a ladies hatpin to the base of the wings underneath, press down the wings to the correct position with an open finger, heat the hatpin red hot in a candle and touch the shellac ; it is a delicate operation, to be avoided, if possible ; every butterfly in the De Niceville collection in the Indian Museum has a touch of shellac at the base of the wings.

Fig. 8.

25. The best form of envelope or "cocked hat" for taking butterflies is made as shown in the sketch. I use 3 sizes, where A $\times$ B are respectively $6\frac{1}{4}$ $\times$ $4\frac{3}{16}$, 5 $\times$ $3\frac{3}{16}$, $3\frac{1}{4}$ $\times$ 2 inches : C = $\frac{2}{5}$ B. The large size fits into a Jacob's biscuit tin vertically with the long side down ; the medium size fits in with a short side down into a cigarette tin or Swallow and Ariel's biscuit tin with the long side down ; the latter two kinds of tin takes the small sized papers

with the short side down. A fairly stout, slightly absorbent paper should be used ; the pages of this Journal would be excellent, not that I mean that they should ever be used for such a purpose, but it is the right kind of paper. Empties can be tied together, 50 in a packet ; full papers are best tied in packets of 6 to 10 by means of a bit of cotton folded round them the ends being wetted and twisted together. Given a cardboard template and a pair of scissors, a chuprassie can turn out the envelopes. Plenty of powdered napthalene should be put in the box. The butterfly should be put in the envelope with its antennæ well folded back as in the sketch. The envelopes should be cut so that the flap has no printed matter on it and thereupon should be written the name of the butterfly, the locality, elevation and date. Don't put more than one butterfly in an envelope. A pinched butterfly may ooze a little after death and it is a good thing to look inside when labelling and see that it is not going to stick to the paper. Another point to look out for is damp ; butterflies fresh caught and stowed away in a box are apt to get rotten and mouldy ; they should be given a chance to dry by putting the envelopes in a meatsafe or, in damp climates, in an airtight box with calcium chloride driers.



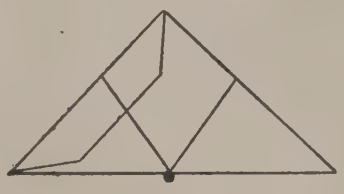


Fig 9.

26. People, who have set out to write a book on the butterflies of India, have been unfortunate. L. DéNiceville commenced " The Butterflies of India, Burma and Ceylon " in 1882 and by 1890 had completed 3 volumes dealing with the Danaids, Satyrids, Morphids, Nymphalids and Lycænids ; it is the best book on the subject, though the nomenclature is out of date ; copies of it are now and then advertised in the "Pioneer" for about Rs. 150. F. Moore started " Lepidoptera Indica " in 1890 and died after finishing two thirds of it ; the work has been completed by Col. C. Swinhœ; it runs to ten Volumes and contains illustrations of every butterfly, but it cannot be obtained for less than £60. Col. C. T. Bingham published in 1905 and 1907 volumes 1 and 2 of the " Butterflies " in the " Fauna of India " series and then died ; the last Volume is being written by Capt. N. D. Riley of the British Museum ; the first two Volumes were issued at a guinea each and are excellent books with coloured plates, but they are out of print ; copies could probably be obtained through one of the London second-hand dealers in scientific books. Shortly before the war, Dr. A. Seitz of Germany commenced the publication of " The Macro-lepidoptera of the World ", a magnificent work with short descriptions and numerous coloured plates. The palæarctic section has been completed in about 100 parts at s.1/6 a part ; the Indo-malayan section (Rhopalocera) is complete except for the Lycænids and Hesperids and will probably run to 150 parts at /2 ; it is extraordinarily good value for the money ; I obtain my copies, in the English translation, from Watkins and Doncaster. The following books published some years ago may be obtainable from second-hand dealers ; " Hesperiidæ Indicæ ", by Watson ; " Revision of the Oriental Hesperiidæ ", by Elwes and Edwards ; " Revision of the Papilios " and " Revision of the genus Charaxes " by Rothschild and Jordan ; " Revision of the Amblypodia group " by Bethune Baker. In Volume 21 of the Journal I published a list of the butterflies of India, which can be

obtained from the Secretary for Rs. 2 ; I hope to revise it soon, if the Secretary will accept publication.

27. I will close this article, which already seems to me too long, with a few notes on where to look for butterflies and on the various localities that a collector may have an opportunity to visit. Flower gardens in general attract numbers of butterflies, but, generally the rarer species are not to be found there. As a rule the collector must get into the jungle ; beat the bushes and see what comes out ; inspect flowers and especially flowering bushes most cautiously and carefully ; don't neglect looking at carrion or manure ; wet patches often attract butterflies in crowds ; going along nallahs with running water is a paying business ; males of rare species are often to be found on the tops of hills, especially towards midday. Don't try and catch a fast-flying large butterfly ; you will only damage him ; watch where he sits and then have at him ; many butterflies, unless seriously disturbed, return again and again to the same spot and with adequate patience can be secured easily. Keep your eyes wide open as you walk along and if a butterfly gets up before you can catch him, chase him to see where he sits next and then stalk him warily ; rapid movement is the one thing he can really see best and if he does not understand it, he runs away.

28. Starting with the extreme South, my personal acquaintance with Ceylon is limited to a week's visit to Kandy in September where, in Lady Horton's walk, butterflies galore are to be obtained, if you can manage to defeat the leeches, which are more persistent than any I have ever met. Here one sees the large Papilionids, *ornithoptera* and *polymnestor* in comparative abundance. But for full information regarding Ceylon I would refer the collector to an excellent account of the Ceylon butterflies by Mr. W. Ormiston which appeared in " Spolia Zeylanica " in 1918. I have never visited Travancore, but a certain very peculiar Satyrid, *Parantirrhœa marshallii*, is only to be found there ; a list of the butterflies appeared in Vol. 6 of the journal. I spent 6 weeks at Kodai Kanal some years ago in August to October and an account of the butterflies will be found in Vol. 20 ; Kodai Kanal is a most delightful hill station in the Palni Hills and deserves to be better known. On the top of the plateau not many butterflies are to be seen, but a rather special fritillary, *Argynnis hyperbius castetsi*, is only to be found there. In Tiger sholah good collecting is to be done and a certain Satyrid, *Mycalesis oculus*, peculiar to this part of India, is to be found there in swarms. At the bottom of the plateau, just above Krishnamanaikam tope or the tope for short, any quantity of good butterflies are to be caught ; I have never seen so many butterflies in my life as on the road 2 miles above the tope on a bright day after heavy rain the night before. Coming further North is the little province of Coorg, which is an excellent district ; the late Mr. F. Hannyngton published an account of the butterflies in Vol. 24. I have never visited the Nilgiris and refer the collector to a most comprehensive list published by Sir G. Hampson in the Journal of the Asiatic Society in 1888. The North Kanara district is again a most fertile country and a full account of the butterflies with descriptions and figures of the early stages appeared in Vol. 10 of the Journal. For Poona see P. Z. S. 1885 ; for the Konkan Journal Vol. 15 ; for Matheran Journal Vol. 8 ; for Cutch Vol. 12 ; for Mhow P. Z. S. 1886. An excellent list of the butterflies of the Central Provinces was published in volumes 5 and 6 by Mr. J. A. Betham. I spent a number of years at Jabalpur and strongly recommend the neighbourhood of what are known as the temples along the Nerbada road as a good collecting ground, especially during the monsoon and in the Spring ; there are a number of flowering trees, which are very attractive to butterflies. Pachmarhi is a very interesting locality, where much work remains to be done ; two Satyrids are peculiar to it, but its chief interest lies in the fact that it is the meeting place for the North Eastern and the Southern fauna ; the best localities are Jumbo Deep, Waters Meet and Dhupgarh, but there are lots of others. I believe the Northern districts

of Madras would yield a number of specialised local races and, as far as I know, no one has ever worked them out.

29. For the butterflies of Karachi see Vol. 2 and 3 and P. Z. S. 1884. I know of no list from Baluchistan ; it is an interesting district and after many efforts I got myself posted there one November but am sorry to say was transferred again the following March. I believe that Hanna and Urak are good collecting grounds, and I am sure that Ziarat would be productive. A really good collection from Baluchistan would be of value to science. In the Safed Koh beyond Kohat good and little known butterflies are to be obtained. At the beginning of this century it was my good fortune to spend two years in Chitral, a most delightful and interesting country, containing a number of butterflies not met with elsewhere. The central Asian strain is very evident, but a great number of the butterflies have developed into well defined races. I found the beautiful Ashreth valley leading up to the Lowarai Pass most productive in May and September ; the Retreat up the Tarben Nallah and Sanitarium Hill near Drosh were good places and my collectors did well in the Utzun nallah. I spent ten days in August up the Shishi Kuh at Madaglasht and found butterflies abundant. Sanoghar is a good locality, while a visit to the Shandur Pass is worth nearly all the rest put together. This Pass is 12,000 feet above sea level and contains a lake about $1\frac{1}{2}$ miles long by $\frac{1}{2}$ mile wide ; in July and August the borders of the lake are carpeted with flowers and, what are known as really rare butterflies, are abundant- above the Pass rare Parnassiids are to be encountered, while the valley between; the pass and the village of Laspur swarms with butterflies. I shall always look back with the fondest recollections to my two years in Chittral. An account of the butterflies will be found in Vol. 14.

30. I am afraid I can give no information regarding Kashmir or Ladak, having never visited them myself and I know of no published list of the butterflies. Rare butterflies are to be obtained at high elevations, but on the whole it does not appear to be a butterfly collector's paradise. I have spent 3 seasons in Murree, but it is a poor country for butterflies ; the Galis in the neighbourhood are very much better, more especially in the Spring to the end of June. Dunga Gali is well worth a visit. The bottom of the Lahur Valley, between Dunga and Khanspur is chock full of butterflies in June ; it is a fiendish place to get down into and the best method of approach is by means of a path leading down from behind the Roman Catholic Church at Khanspur. The valley below the Chief Commissioner's house at Nathia Gali along the old Kashmir Road is a good collecting ground, as is also the catchment area of the Murree watersupply and the top of Mokshipuri hill above Dunga, where a Parnassiid is to be caught. An account of the butterflies of this part of the Punjab, including Attock and Rawalpindi, etc., is to be found in P. Z. S. 1886. For the Kangra District see P. Z. S. 1882 ; from Kulu I know of no list having been published ; for Lahore see Vol. 25 of the Journal. I know of no connected account of the butterflies of Simla ; I have spent several years there and it is undoubtedly superior to Murree. Round Elysium Hill, Potters Hill and Summer Hill a good many species are to be seen, but better places are Mahasu and Mashobra, while to those who can find the leisure, a visit to Narkanda and Bagi is well worth undertaking. The late Mr. P. W. Mackinnon in Vol. 11 published an excellent list of the butterflies of Mussoorie ; I spent a profitable ten days there many years ago and found the Brewery nallah most productive in May ; the further East one goes in the Himalayas the more species are to be obtained. Kumaon is a country I am not acquainted with, but it is a most interesting part of the Empire, since it is more or less the meeting place of the N. W. Himalayan and the N. E. Indian sub-areas - a good list was published by the late Mr. F. Hannyngton in Vol. 20. An investigation of the butterflies of Nepal and Western Garhwal is most desirable. For Lucknow see Vol. 14.

31. The N. E. Indian fauna proper commence with the Darjiling district or

Sikkim and a good list of the butterflies was published by DéNiceville in the Gazetteer of Sikkim, 1894. I spent April and May here some years ago and added considerably to my collection, but a lifetime is required to get to the end of the species to be obtained in this prolific area. Senchal or Tiger Hill yields the magnificent *Teinopalpus* and the Teesta valley simply swarms with butterflies. For Cachar see J. A. S. B. 1886 ; Khasi Hills T. E. S. 1893 ; Abor country Vol. 23 ; Mishmi Hills Vol. 22 ; Manipur and Naga Hills Vol. 21 and 23. Coming to Burma there are the following lists ; Chin Hills Vol. 10 ; Tharrawaddy Vol. 25; Shan States T. E. S. 1890 ; Karen Hills P. Z. S. 1891 ; Tenasserim J. A. S. B. 1886 ; Tavoy Vol. 27 ; Mergui J. Linnean Society Vol. 21.

32. During the winter of 1920-21 my wife and I spent a most delightful 5 months in Burma catching butterflies and I strongly recommend others to follow our example. We started off with Thandaung in the Karen hills at the end of October, but were a little late for the top of the hills ; September, October, March and April are the best months. On the top of Thandaung-gyi, *Teinopalpus* is to be caught and other good collecting grounds are the Circular road and the neighbourhood of the cemetery, also round the dak bangalow. The road down to Toungoo is a magnificent collecting ground more especially in the neighbourhood of Shwenyaungbyin, the forest down to Pettichaung and the neighbourhood of the latter place. In many ways the Thandaung ghat is one of the best collecting places in the Indian Empire ; it is the meeting place of the Chinese and the Malayan elements and possesses a number of species or well defined races, that do not appear to be found elsewhere. We then spent a month in the Tavoy district partly at Kanbauk, near the Heinze basin and partly at Pagaiye, 10 miles inland from Tavoy town. At Kanbauk the happy hunting grounds are the hills on either side of the Wolfram mines and the mangrove swamp bordering on the Heinze basin, where the stately Hestia is to be seen sailing to and fro. At Pagaiye the hill top just beyond the village is a wonderful place for rare species, while the valley South of the river is a good collecting ground. The end of December we spent as guests of the Burma Para Rubber Company on King Island, Mergui ; the edges of the plantations, where the virgin jungle commences, were full of butterflies and more especially along the Nallah at the North East corner ; wild ageratum was in flower and attracted crowds. We then proceeded to Moulmein, up the river to Kyondo and on to Kawkareik, whence we marched over the Dawna range and stopped at Thingannyanyaung on the Siam side at the foot of the hills. The old path from this place to within a few miles of Kawkareik is a magnificent hunting ground, while the cart road up to Sukhali is full of good species; Misty Hollow on the top of the Dawnas yields a few species not found elsewhere. We finished up with Upper Burma, but found we were rather too early in the year to catch the best species in that area ; a few good butterflies were obtained at the top of the waterfall at Anisakan below Maymyo and in the valley above Loi-An near Kalaw ; the road from Kalaw to Thazi contains several good hunting grounds. I may add that many good butterflies have come from the Ruby mine district, North of Mandalay and from the foot of the hills near Bhamo. For a visit of this sort I may say that a friend in Rangoon, who knows Burma is a very great asset ; we were lucky and are eternally grateful to all our friends for what they did to make our visit a success.

33. I may say that I have been collecting butterflies in India for 23 years and my interest increases as the years go on, my only regret being that I did not make better use of my earlier opportunities. I am a hard working individual at my profession and find that the pursuit of my hobby is the best rest possible from the cares of work, both during the periods I am at work and during the few spells of leave I have been able to obtain. It is a healthy out-door pursuit, with occupation for the evenings, and not only that, but I can look forward to plenty to do when I retire. I most strongly recommend anyone who has read through this article to take it up and can promise that the Society will give him or her

every assistance ; they have an excellent library, a good collection to refer to and experts, who will name anything. For those in the neighbourhood of Calcutta there is the Indian Museum to refer to and the Director of Zoological Survey will offer every assistance ; there is a most complete library and the very complete DeNiceville collection. Visitors to England should inspect the National collection in the basement of the South Kensington Museum, where Capt. Riley will do anything he can to help them. Don't forget that all the three institutions I have mentioned will be very glad to receive specimens especially from out-the-way localities.

[A subsequent paper by Col. Evans will deal with the method of identifying the commoner species of Butterflies.—EDS.]

REVIEW.

ZOOLOGY, A TEXT-BOOK FOR COLLEGES AND UNIVERSITIES

BY

T. D. A. COCKERELL.

Professor of Zoology, University of Colorado.

(Pp. xi+558. (New World, Science Series. Edited by John W. Ritchie). Published by the World Book Company. Yonkers-on-Hudson, New York. 1920. Price three dollars.)

This is an ideal work for the general student who does not intend to pursue his studies far, or for the amateur, who while specially interested in a particular branch of zoological science, also desires to acquaint himself with its general principles. Professor Cockerell is known to all biologists as a man of extraordinary versatility and individuality; and this individuality shows itself in his book, for he has found space for such interesting questions as Mendelism, fertilization, sex, nature and nurture, alcohol and heredity, variation, selection, Protozoa and disease, disease in relation to human evolution, eugenics, sociology from a biologist's point of view, the pedigree of the horse and the elephant, the evolution and characters of man, and the zones of life, most of which are not discussed in ordinary text-books. There is here plenty for the student to ponder over, and some of the chapters are not quite readily understood, but these are big questions and big questions are difficult. "From a psychological and pedagogical standpoint, it is surely an error to suppose that each idea must be luminously clear at the moment of presentation."

A feature of great interest is the introduction of biographical chapters closely connected with the chapters that follow. "We are too apt to receive the gifts of science without asking whence they came...What we have to-day was not gained without arduous toil and persistent zeal, often in the face of many difficulties. As the pious studied the lives of the saints, so may we pause now and then to learn how scientific heroes have won new territory for the kingdom of science. Thus, if we have anything of generous response within us, we may return to our studies refreshed, resolving that we also, in some measure, will further the good cause." So, short sketches of Mendel, Darwin, Linnæus, Fabre, Pasteur, Agassiz, and Baird are presented. In a new edition it is hoped that men like Huxley will receive somewhat fuller treatment, and the author will tell us something of the father of biological science—Aristotle, and Cicero's great imitator—Pliny.

The author is never pedantic, never dull, and his chapters—of which there are sixty-six are unusually brief, but lucid, freshly written and to the point. "The biology or zoology for the average individual who has no thought of specializing in the department should not be too morphological, too rich in detailed facts of structures and classification. Experience shows that such minutiæ are not remembered, and do not leave as a residue any broad and useful conceptions. The working out of a single problem or small group of problems in detail is a different matter, as it teaches of methods and points of view in a manner never to be forgotten, and may well open the way for an amateur interest which will remain a blessing through life."

Most of the illustrations are good: many novel and interesting, and in a new edition further light improvements could easily be made.

For all, the book is a good introduction; and the fact that it relates chiefly to New World zoology does not make it any the less interesting to us in India. Let us hope that it will suggest to some competent biologist the necessity of a work on Indian zoology written along similar lines.

OBITUARY.

Lieutenant-Colonel L. L. Fenton.

Lieutenant-Colonel Layard Livingstone Fenton, who died recently at Marsh Hall, South Moulton, aged 72, was the son of the Rev. George Livingstone Fenton, late Chaplain of St. Mary's Church, Poona, and of the English Church, San Remo. He was born in 1849, joined the Royal Artillery in 1870, and was appointed to the 1st Grenadiers, Bombay Native Infantry (now 101st Grenadiers, I.A.), in 1872. In the following year he joined the Indian Revenue Survey, and was appointed Political Assistant at Kathiawar in 1889 and President of the Rajastanik Court in 1896, which appointment he held until he retired in 1901. During the War he offered his services to the Government of Bombay. Lt.-Col. Fenton was well known in many parts of India as a keen sportsman and naturalist and contributed frequently to various sporting journals.

Members of the Society will recall Lt.-Col. Fenton's interesting articles on the Indian Lion published in Volumes XIX and XX of the Society's Journal. The preservation of the Lion from extinction in this country is due very largely to his efforts.

In addition to his articles on the Lion the readers of our Journal are indebted to him for a number of contributions on a variety of subjects dealing with Sport and Natural History. Col. Fenton is to be classed among those intelligent Field Naturalists who by their carefully collected notes and observations do so much to assist the Scientific or Museum worker in unravelling the many problems before him.

EDITORIAL.

The Committee have great pleasure in announcing that H. R. H. the Prince of Wales has honoured the Society by becoming not only a Life Member but also its first Patron.

On receipt of H. R. H.'s gracious intimation H. E. Sir George Lloyd, the President of the Society, sent the following telegram to Vice Admiral Sir Lionel Halsey :—

> "Please convey to His Highness respectful and heartfelt thanks of the members of the Bombay Natural History Society that His Royal Highness has been graciously pleased to become a patron of the Society."

Although No. 1 of this volume was only sent out to members towards the latter end of January, the Editors had hoped to be able to issue the present number, No. 2, by the end of February along with the Index for the previous volumes and try and bring the journal out quarterly instead of at the very irregular periods of the past. Unfortunately our resolution has gone the way of so many New Year resolutions. We do not wish to blame the Press, but they are too popular and at the beginning of the year the extraction of proofs from the Press is as difficult as the extraction of an old wisdom tooth. Let us hope it is not as painful.

The difficulty of bringing out the journal at regular intervals necessitates an increase in the size of each part and a complete journal is now too bulky to bind in one volume. We are issuing with this number therefore a title page and index of contents of the first two parts so that they can be bound together as a half volume. The index of scientific names will, when issued, apply to the whole volume and can be bound up with the second half volume.

A list of members of the Society, corrected as far as possible up to the end of 1921, will appear in the index to Vol. XXVII and will not therefore be repeated in this number. The accounts for 1920 will also appear in that index number but some comment is necessary on the state of our funds at the end of 1921. The accounts for that year will be found at the end of this number.

In 1920 our income from subscriptions was Rs.18,993 paid by 1,266 members for that year and we also received Rs. 2,582-0-0 on account of back and future subscriptions. Our expenses on account of the journal in that year were Rs.9,000 and we had notice of a very heavy increase in the cost of printing it. Similarly with salaries and office expenses. In 1920 the former were Rs. 14,700 and the latter Rs. 10,536 and on account of the growth of museum work and work in connection with the issue of the snake charts and the volumes on game birds, we knew that we had to face increased expenditure here.

The Committee, therefore, recommended to members the advisability of increasing the annual subscription and at the same time raising the entrance fee. The Life membership fee was raised to Rs. 350 though old members were to be given six months grace to commute at the old figure of Rs. 200 should they so desire. These recommendations were accepted by the members and no less than 60 commuted their annual subscription and became Life members. Out of a nominal roll of 1832 at the beginning of 1921, 432 names have disappeared, some because the increase in the cost of living necessitated a careful pruning of subscription lists, others because absence from India had lessened their interest in the Natural History of India, a few we regret to say, because of death, but practically none because they did not consider membership of the Society worth an annual subscription of Rupees Twenty-five.

In 1920 when the entrance fee was Rs. 10 only 119 new members joined. In 1921 with an entrance fee of Rs. 20, we have obtained 87 new members.

Although, as mentioned above, only 432 members' names were removed from the list, the increased subscription was received from only 1112, and 113 members have still to pay the balance of Rs. 10. Unfortunately the difficulty of collecting the enhanced subscription continues this year, mainly through the remissness of the Honorary Secretary who, when notifying members of the increase last year, forgot to enclose revised Banker's order forms, with the result that a considerable number of members, who pay their subscription in that most convenient way and who had paid the increased subscription for 1921, have had their subscription for 1922 paid by their bankers at the old rate. This has necessitated a good deal of trouble to all concerned but revised Banker's orders have been sent out and the Honorary Secretary takes this opportunity of expressing his regret for his strategical blunder.

Now as to the 1921 figures :—

Receipts from subscriptions for the year were Rs. 28,126 and past and future subscriptions accounted for Rs. 2,275 making a total of Rs. 30,401. This shows a gain on 1920 of Rs. 8,826. Entrance fees in 1921 realised Rs. 1,470 as against Rs. 1,130 in 1920. As regards other income which may be considered recurring, Rs. 2,851 was received as interest on securities or bank deposits and Rs. 2,598 from sale of back journals as compared with Rs. 2,563 and Rs. 1,680 respectively in 1920.

One item of income which so far as the issue of the journal is concerned ceases to be of a recurring nature is the Government grant which in future will have to be spent entirely on the museum. In 1920 we received Rs. 5,000 and in 1921 Rs. 15,000. We hope the Bombay Government will increase this in 1922.

Now turning to the expenditure side the figures show that we spent Rs. 16,436 on the journals in 1921 as compared with Rs. 9,000 for the previous year, and no less than Rs. 27,221 on salaries in 1921 as compared with Rs. 14,685 in 1920. The salaries may be divided as to Rs. 17,777 for the Curators and Museum staff and Rs. 9,444 for the clerical staff.

These great increases make one very anxious for the future. The journal must be maintained and improved as without it we cannot carry on the good work the Society has done for nearly forty years. The research work of the Museum must continue and by moving our collections to the Prince of Wales' Museum we have accepted the obligation of maintaining a Natural History Museum for the benefit of the general public, and this means very heavy expenditure on mounting and exhibiting specimens. Fortunately there have been during 1921 certain receipts other than those already mentioned. These, however, cannot be counted on as regular sources of income and one, Life membership commutation, has to be regarded as capital and invested. The receipts referred to are :—Life membership fees Rs. 12,000, and receipts on account of publications such as the Snake charts and the volumes on the Game Birds of India. Neither of these two latter have so far realised more than has been expended on them but the year 1922 should balance the expenditure and leave the Society we hope a small profit.

The work before us in the Prince of Wales' Museum necessitates our raising funds from other sources than those at present available. The Government contribution of Rs. 40,000 is quite inadequate. Out of this sum we have already expended Rs. 8,545 in preparing for the Prince's visit which most unfortunately did not come off—and the opening of the Museum for the general public. Most of this latter expenditure is of a non-permanent character.

The close association of the Prince of Wales' Museum, Bombay, with the visit of the present Prince of Wales led the committee to apply to the Prince of Wales Bombay Reception Fund for increased help over and above the grant of Rs. 2,000 donated by the Fund for expenses in connection with the Prince's visit, but the decision of the Committee of the Fund to reserve the whole of

the money for the purpose of erecting a Children's Hospital as a memorial of the visit precluded compliance with the request.

The Western India Turf Club is a generous donor to so many institutions in Bombay that an appeal was made with some hopes to them; the ground for the appeal being the enjoyment the Society's museum would give to the general public of Bombay. We are confident that the Committee of the Turf Club realised this but we suppose they found a difficulty in considering the benefit conferred as one of a charitable nature and so, probably rightly, had to decline our request.

Our only recourse seems, therefore, to be what should after all be our best resource, namely, our own members. At the annual general meeting held at the end of February it was decided to ask members to become Vice-Patrons of the Society by contributing sums of Rupees Five Thousand and over for the use and benefit of the Prince of Wales' Museum, Natural History Section. Monies so received will be used for the purchase of show cases and the mounting of specimens and the various show cases will bear inscriptions reading somewhat after this style :

"Presented by ——————————————————— a member of the Bombay Natural History Society and mounted for exhibition from funds provided by ——————————————— a Vice-Patron of the Society."

We wonder whether we shall have the good fortune to exhibit any trophies presented by H. R. H. the Prince of Wales ? Our Curator, Mr. Ellison, accompanied H. R. H. during his shoot in the Nepal Terai, Mysore, Bhopal, Gwalior and Patiala and looked after the live animals presented to H. R. H. by the Prime Minister of Nepal during their journey to Bombay. We hope that a future issue of this journal will contain an account of the Prince's shikar in these three places.

H. E. Sir George Lloyd, the President of the Society, accompanied by H. E. The Hon'ble Lady Lloyd paid a private visit to the Natural History Section of the Prince of Wales' Museum and afterwards to the other sections on the 19th December. The Natural History Section, as arranged for the visit of H. R. H., was open to the general public for eight days in November 1921. It remained open after the public opening until the end of January and then had to be closed to all but members. The reason is that, until glass show cases and mounted specimens can be provided, the exhibits will spoil by being exposed to light and air. The Curators are doing all they can to get the Natural History Section ready for permanent opening to the public. Various rules will have to be framed in this connection, but it is unlikely that these will be of a definite character until the Museum Act has been amended by the Bombay Legislative Council and two members of the Society officially appointed to the Board of Trustees.

Turning now to the work of the mammal survey, we regret to have to record the resignation through ill-health of Mr. Riley O'Brien who had been working in South India. His work had been greatly handicapped through continual attacks of malaria which finally incapacitated him from jungle work altogether. His place has been taken by a young collector, Charles McCann, who received his early training as a Naturalist and Collector under the keen eye of the Rev. Father Blatter, S. J. Mr .McCann commenced his work on behalf of the Society by visiting Kanara and skinning and skeletonising a rogue tusker elephant which had been shot at Honavar. Mr. McCann was successful and skeleton and skin are now in the Society's rooms awaiting the advent of a Vice-Patron of the Society to enable them to be mounted and exhibited in the Museum. Along with the skeleton and skin he brought a pair of tusks weighing 18 lbs. Unfortunately the shikari who had shot the elephant claimed these tusks and as the Society could not afford to buy ivory at the market rate delicate negotiations had to be entered into to see what was the lowest figure the shikari would receive for the

honour of presenting the tusks to the Society, and what was the highest figure the Society could go to show its appreciation of the shikari's services. The result of the negotiation was that the tusks became the property of the Society on payment of Rs. 50. Mr. Wells has been in Bombay during Mr. Ellison's absence with the Prince and his help with the Society's collections has been greatly appreciated. The medical authorities have now certified him as clear of malarial infection and he has left for the Punjab to work in the neighbourhood of Dharamsala. His work will be greatly facilitated by the assistance kindly promised by the various Government officials there, and we take this early opportunity of thanking them and, more especially, Mr. Hugh Whistler for their valuable advice and help.

A collection sent over from Mergui by Mr. Primrose has given great pleasure to the Society's Curators and will, we hope, do the same to the authorities at the British Museum. It shows how much can be done under difficulties and the difficulties experienced in working amongst the Islands of Mergui, Archipelago, are many and varied. A description of these will be given in the papers dealing with Mr. Primrose's collections. A collector's difficulties of a different nature are humourously referred to elsewhere in a paper entitled "In Lighter Vein."

The first two volumes of the Game Birds of India have at last materialised and are now in subscribers' hands, and we hope the pleasure of receiving these splendid books has obliterated all remembrances of the long delay. We hope these books will be the means of bringing many new members to the Society as though the Booksellers in this country have converted the English price into rupees at the good exchange of 1/4 and it is cheaper for those in India to buy the book in India rather than in England (the reverse is of course the case for those in England) there is a good reduction off the published price given to members, though this is naturally not as much as is given to the original subscribers who, by subscribing, enabled publication to be undertaken. We congratulate Mr. Stuart Baker on the publication of these fine volumes, and we also, on behalf of the subscribers, express our very cordial thanks to Mr. Millard for all the work he has done.

The Editor who has written these notes would like to congratulate his brother editors, Messrs. Ellison and Prater, not on their not having written them though perhaps such would be a matter of congratulation, but on their appointment as Corresponding Members of the Zoological Society. Their position and work enables them to do a great deal for the Zoological Society of London and they are carrying on the work of their predecessor Mr. N. B. Kinnear and of Mr. H. M. Phipson and Mr. W. S. Millard. Whilst on the subject of the Zoological Society of London we would advise members that the gardens at Regents Park are urgently in need of live animals. Dr. Chalmers Mitchell in forwarding a list of animals wanted by the Zoo mentions the following:—Young Elephants and Rhinos, Tigers, Swamp Deer, (Stags especially), Black Buck, Nilghai, Takin, Goral, Serow, Tahr, Markhor, Barhals, Wild Dogs. Among the birds he mentions Pheasants and Hornbills; he adds that no Lions, Leopards or Cattle are wanted.

Will members who are willing and able to present any of these, correspond with the Curators of the Bombay Natural History Society as to the necessary arrangements to be made to send the animals home.

R. A. SPENCE.

IN LIGHTER VEIN.

NOTES BY A PSEUDO COLLECTOR.

I

Finding that very few persons seem to have any idea as to what a Mammal Collector's work is like, or how he " muddles through it, " and hoping that some of the material contained in these notes may prove of use to other Collectors, I have presumed to offer them for publication. I shall start by trying to give my readers a general idea of what is as likely to happen as not to any Collector arriving at the area in which he is to work, and not an inhabitant of which he can even claim the slightest acquaintance with. I may mention that " Truth being stranger than Fiction " I trust that nothing I say will be taken as evidence against me.

On the....th of.....I received instructions to proceed to X and report on my arrival to Z, who had kindly offered to help any Collector working in this area. I arrived in due course and, as instructed, made straight for Z's Bungalow and found him at home. After enquiring after my health and the kind of journey I had had, he remarked, " But, Good Lord, I never dreamt they'd send you here at this time of the year, you'll not be able to do a thing before—even the Natives don't go into the Jungle now." That was rather depressing, so to change the subject, I asked him if he had seen the last " Journal ", to which he replied, " Oh, dear, no, I am not a Member, in fact I take no interest at all in Natural History, but a cousin of mine married a chap who was a great man on that sort of thing, (I love that expression), went in for examining the blood of all these brutes, don't you know, bats, rats, owls, monkeys, eagles, etc., he was a what-you-may-call-'em (I had already thought so) now what *is* the word ? *You* must know, a Hem, Hem, Hemma, what *is* that word ?" The only one starting with Hemma that I could think of did not seem to end properly, so I kept silent and tried to look as though wrapped in thought. " Ah, well, never mind " said he, " I'll remember it in the morning, it's funny sometimes how one forgets a simple word," and he looked very cock-sure about it. " Now let me see what I can do for you, I expect you're brought your kit along with you for camping, such as tents, crockery, cutlery, glass, cooking utensils, camp furniture, tables, chairs, beds, mattress, pillow, bath, wash-basin and other odds and ends." I only seemed to have the odds and ends but looked cheerful and said "Rather ". I asked him if he could put me on to a decent interpreter and I was told it could be arranged, so left him promising to let him know of any wants I discovered. Before describing the interpreter incident, I will try and describe the attitudes and ideas of the Europeans of the District. Before going any further I must say that everyone of them did all in their power to make me feel at home and to give me a good time and I shall always remember their great kindness.

After a few days residence in X, Z asked me to go along to the Club with him and meet some of the Members, and I duly accepted his invitation. I found after being introduced that my fame had gone before me, as one lady said as soon as my host had mentioned my name "Oh you are the gentleman who has come to collect squirrels, aren't you ? " A Planter to whom I was introduced said " You are the Rat-catcher, aren't you ? " and there were other similar remarks made. The people seemed to take it for granted that I must be a very up-to-date naturalist, in fact, judging by some of the questions I had asked me, some seemed to imagine me an embryo Darwin. The questions ranged from the difference between the leopard and panther to whether a flea was an Aptera or Rhynchota. I, in turn, referred the enquirers to the B. N. H. S., Blanford, Sterndale, Darwin, Hæckel and numerous other works real and imaginary. The information I gathered was equally varied : I was told by some of a

certain mammal that swarmed, but only up a certain river, by others that it was very very sparsely distributed all over the district except up the same river where it had never been known. I remember asking about flying foxes, and the time of year during which they occurred in X was disputed hotly by various men and there seemed at least half a dozen opinions as to the months. However, as one long-headed gentleman said "Good Lord, fancy, here's this man been sent all this way to shoot flying foxes by people in Bombay. Ha! Ha! by Jove, it is rich." I was glad to see however he was sufficiently observant to have noticed the occurrence of this animal in Bombay.

Of course I was offered most interesting specimens, such as shark's fins, tailor bird's nests, oyster shells, young mongrel pup, kittens, etc. I was also told of the Black Gecko which my informant was positive was deadly, in fact colubrine poisoning or viperine were not in the same street. Another interesting thing I was told about this reptile was that if it took up it's abode in a house, death to one or more of the inhabitants was certain as it would attack anyone within reach and had been known to drop from the ceiling on to the neck of a person and grasp him firmly by the ear injecting a lethal dose of venom meanwhile. I tried to look serious and told him I had not heard of it but would not forget what I'd been told, no more I shall.

As regards the general opinion on a Collector of any specimens of Natural History whatsoever this seems to vary a lot, but that he must be just a "little touched" is unanimous. This is a pity as it is a slight handicap to contend with from the very commencement, even should the general opinion be correct. Now, having got to know some of the residents, naturally I was anxious to learn as much as possible about my area and I was told by several people that I had come at the wrong time of the year and that several months would have to elapse before I could even think of starting work. Several said what I wanted for my work was a launch, which was sound enough no doubt but out of the question. However, a certain A was pointed out to me as *the* man who could put me in the know and to him I went. He was kindness itself but beyond "You can't do anything now," I got nothing out of him. Of course I picked up my information as I went along and found, when I started work, that I knew sufficient to be of considerable help to me so that I was quite content. All I would remark is that anyone going on a similar expedition would do well to remember that "while many will give thee counsel wisdom cometh only from a few". The questions put me regarding my work were as varied in their character as they were numerous. One that seemed the favourite was "What do you think you will get?" From what I had heard of the climate in the jungle "at this time of the year" I felt like saying "FEVER," but that would have been rude, though true, as after events proved. One advantage I found in talking a certain amount of shop was that any one possessing an animal or insect of any description was very keen on showing it to me and thus I was able to see specimens I might otherwise have missed. X I found abounded in pet monkeys, more bungalows possessing them than not. I made a monkey-examining tour once and found the following:—*H.lar*, *P. fascicularis*, *P. arctoides*, and *P. obscurus* I was told had been kept by a certain person. The specimen of *P. arctoides* I saw was immature and a most amusing little animal it was too, full of mischief. The orbital area was a ruddy pink dotted with black as though charcoal dust had been sprinkled on to it. He had a very intelligent expression and quite a charm of manner, it was very amusing to see him shake hands, which trick he had learnt, but for some reason he seemed to prefer offering a hind foot to be shaken and the expression of utter boredom on his face when turning his back and raising a hind foot was really a study. This monkey I was informed had been brought from the forest about 20 miles N. of X, where they inhabited the hills near the coast. I was also shewn a mangled skin of *M. javanica*.

P. fascicularis struck me as being a particularly obnoxious little brute, as while possessing all the habits and customs of that ungentlemanly animal the Bengal Monkey its defects are enhanced by an expression of the most abject misery.

II

"The Interpreter."

One mail day shortly after my arrival, when I was in the throes of writing letters against time, a rasping cough distracted my attention from the business in hand. Knowing that the average Indian is as good at waiting as he is at coughing I decided to carry on with my correspondence till it suited me to enquire into the business of my cough-racked friend outside. I soon found however that to write coherently with a cough such as his ringing in my ears was impossible, so I shouted in Hindustani and asked who the cougher was and what his business to which I got the intelligent reply "Hum hai huzoor."

In order to get quit of him quickly I called him in and after a very polite salaam was handed a letter. This was from L.'s clerk and read as follows :—

To—Honoured Sir,

The bearer Yussuf Khan is an interpreter and has been employed as such for some years by the Survey of India parties when working in this vicinity, He is willing to accept Rs. 35 per mensem as a starting salary. You will find him honest and hard working. He is not of menial class being by trade a motor mechanic—I am, etc.

Having read this I had a look at the man and was instantly convinced of the truth of the statement in the letter anent the class to which he did *not* belong and wondered at his condescension in accepting Rs. 35 even as a starting salary, and I wondered if Solomon in all his glory was ever arrayed like Yussuf Khan. He was clothed in a spotless twill shirt, crushed strawberry coloured silk loongy and "Saxone" boots with mauve socks. His hair shone like the raven's wing and from the way it waved I wondered if he used Anzora. In fact he looked as though he had attained the "complete Swaraj" pictured by Mr. Gandhi and promised by him in most months of the year.

After scrutinising him for a few moments I talked to him about the job, salary, etc., and he agreed to start work on Rs. 35 a month, please note the "start,", and to interpret for me and help with skinning when I'd taught him this work. I could never however picture him sitting down to skin a very dead rat but I couldn't do without an interpreter so there it was. Four days before leaving X to start work he asked for an advance, a mere matter of three months pay, and on my asking the reason stated that he wished to buy loongyis. Now his series of loongyis (I can remember at least six different ones), all of the finest silk, had been greatly admired by me so this reason didn't suffice and I informed him that as we should be leaving his lady-friends at X for sometime and going into the jungle,I would suggest his taking his oldest loongyi and cutting it into pieces 24×9 inches of which he'd get about 6 and have a costume suited to the work and environments. This so insulted his sense of decency that I never saw him again and set sail interpreterless if I may coin a word. I have another now but that's another tale.

III

Trapping.

A man once said these words to me and I've never forgotten them and probably never shall. "You know old chap I'm a brainy man and I know it and a man who has brains and doesn't know it is a darned fool". This calm determined statement not even containing the usual "though I say it as should n't" prompted me to ask him what he'd call a man who was *not* brainy and who didn't kid himself he was. He was not brainy enough to answer the question.

Well to anyone in doubt as to which of the above three classes they belong I would say try one month's trapping and you will soon be convinced as to your correct class. During the first fortnight you are certain that you don't even belong to the lowest of these classes but are a pure and simple idiot. I think I am right in cautioning anyone wishing to start trapping not to use too many traps for a start, as you'll get disgusted for a cert. Having gained your experience in setting traps and finding them again you may use your own discretion as to the number you set daily. After some months of this work I find 25 to 30 about right for me but I've been told of a collector who preferred 100 and over and was very successful with this number, but the placing of large numbers of traps takes time, which sometimes can't be spared. I shall now proceed to give my readers all the tips I've collected *re.* trapping but fear that, being but a tyro myself, these are not as numerous as they might be. As nearly all my trapping has been done in heavy evergreen forest I will give you the tips for this type of ground. You will find old fallen tree trunks are a good spot to place traps as rats are very fond of making a run under or alongside these and often have their holes under them so as to have a tight roof over their heads and the last 10 or 15 feet of their road home dry also. These old logs seem to attract the smaller denizens of the forest in much the same way as a light at night attracts drunken men and insects, apparently an irresistable attraction. Under a mass of tangled creepers is also pretty good and if any tree shrews occur in the locality these are the spots they love and in such spots have I caught many. Another good spot is amongst broken rocky ground so if you run across such ground pick on the likely looking spots and try your traps. Rats you'll find mostly visit the traps at night, tree shrews and some other wee beasties by day, so examine your traps at dawn and dusk and you won't go far wrong. As regards changing your traps to fresh spots your bags will help to guide but I don't think it is advisable to keep traps more than 4 or 5 days in the same spots. The only baits I've used are, cocoanut, and dried fish, both of which I've found quite good and are easily procured in most places. Local natives can sometimes tell one of good baits and I always enquire of them regarding such.

In suitable jungle the finding of good spots for your traps is not difficult, in fact is much easier than the rest of the job. Having set your traps you mark the spots where they are by any means you may think suitable, bits of paper or rag, blazing trees or any other method that may strike you, it won't make much difference. In the morning you go to examine the catch and then it is that such facts as the following are brought home to you : That white (we will suppose paper or cloth of this colour to have been used in marking down your traps) which you fondly believed to be a colour strikingly conspicuous under any circumstances can be sometimes nearly as invisible as neutral grey. That a rotten log shaped at one end like a fantastic gargoyle which you thought was absolutely unmistakable can have two or three exact replicas in quite a small space. That spots seen with the sun in the west look very different when seen with the light the other way round. That if there's one track that resembles another there's fifty, and a heap of other little facts (woodcraft I suppose you'd call them) which no doubt you would rather discover yourself than be told a word about. Blazing trees to mark your traps. I have used this method very successfully in jungles far from any villages, but if any natives wander in the vicinity of your traps it is fatal, as nothing seems more infectious than blazing trees and as the native as often as not carries a knife of sorts with him the finding of your traps on your next visit is likely to make you waste much valuable time and language and throw your temper out of gear for the rest of the day. On the whole pieces of paper are better I think than blazing which I gave up the first time I had proof of its being highly infectious.

Always see that the twig or peg, or whatever you tie your trap to, will stand

a fair strain as otherwise your trap may be dragged some little way and searching for it will be no pleasure. Tree shrews I've found die hard and will drag away a trap very often if it is not securely tied. Altogether I consider that a course of trapping would knock spots off a course of Pelmanism and if adopted by the general public would become sufficiently popular, combining as it does healthy outdoor exercise in all weathers with very efficient memory training, to compel Mr. Pelman to cease the further publication of " The little Grey books " or books of any other hue for that matter.

In spite of all precautions the loss of a trap or two occasionally is certain, but to date I have been unable to decide whether it is preferable to have a trap stolen by a local native or to lose it through one's own dense stupidity ; the loss of a few more may help me to decide.

While on the subject of trapping I feel it imperative to say a few words regarding some of what one might term the trapper's enemies. These are ants, rats, shrews and slugs. I mention the ants first as they have caused me more annoyance than the others put together. How many species there may be in India and Burma, or how many there are that I've come in contact with I won't attempt to say but of their having driven me half crazy many a time there is not the slightest doubt.

As these insects have foraging scouts continually on the hunt for provisions it is never long before your trap is visited by one and, as a very efficient line of communication exists between each scout and H. Q., it takes very little time for a message to be sent by him that brings 100's or 1000's to your bait and, as they put heart and soul into their work, your bait diminishes rapidly. When perhaps one-third has been removed to H. Q. a rat comes along and taking a bite at what remains of the bait, is killed. All hands are immediately ordered to leave the bait and start work on the rat and they do so with a vengeance, with the result that on your visiting the trap you find a specimen minus ears, nose, lips and most of the facial skin, not to mention fleshy parts of the feet and skin of the tail. When you find 75 per cent. like this you are glad your lady-friends are not within earshot. So much for specimens caught in traps in the jungle, but your troubles, or rather ants, don't stop at that. When drying your specimen if you don't watch it the ants will have you again by eating away all the skin they can. I find that after a time one gets so into the habit of expecting interference from ants that if by any chance you are lucky enough to strike a spot for a few hours that is antless a terribly depressing feeling of having missed something of vital importance steals over one and causes considerable brain fag till the cause is realised.

Shrews and rats come next in order as though they do not damage as many specimens as ants, those they do they do thoroughly. They usually seem to select on a rarity and just leave sufficient to make you rack your brains to try and discover to what animal the remains belong. This worry in the daytime will very often be the cause of horrid vague haunting dreams at night from which you awake saying, " colour darker, size smaller, tail longer, body shorter, teeth stouter" as you read once in a " Summary " some time back. But the question " than what ? " brings you to full consciousness again and your nerves are so on edge by this time that you have to smoke half a cigarette to soothe you to sleep again.

Slugs and centipedes also occasionally destroy specimens but they are I'm glad to say not sufficiently numerous to be really bad. Centipedes seem to like gnawing the throat and I've more than once caught one at it. Slugs seem to attack the belly more than other parts.

For ants I've found powdered turmeric placed in a ridge half an inch wide round the edge of the board on which specimens are being dried a pretty sure preventative. Napthaline used in the same way is also good but more expensive.

OORIAL. (*Ovis vignei*)

Both animals were shot in the Kala Chita Range, Campbellpur, Dist. Punjab. The photos illustrate the close-curved and open-curved types of horns.

MISCELLANEOUS NOTES.

No. I.—NOTES ON LYDEKKER'S " GAME ANIMALS OF INDIA."

(With a Plate.)

Bison—*Bos gaurus.*

P. 56. The measurements given are wrongly quoted, from Ward's " Records of Big Game." The " widest outside " has been quoted as the length. The irides of the only two bulls I have examined in this particular detail were brown. The blue shade seemed to be confined to the cornea, which appeared unusually convex and slightly opaque.

P. 59. Only bulls well past their prime are permanently solitary. The finest bulls return to a herd periodically to find a cow in season. Young bulls are often found solitary owing to their having been driven from the herd by the master bull.

P. 61. I have never seen a bull with a throat-fringe in India, Burma or Siam.

Buffalo—*Bos bubalus.*

P. 88. Buffalo seem to be undoubtedly wild in the hills west of Paknampo in Siam, but they are by no means numerous. There are a few in the Irrawadi delta, notably near Pyapon, which are said to be truly wild. Those in the Arrakan Yomas (west of Thayetmyo) are said to be descended from a herd which belonged to a local king about 300 years ago, but are quite possibly truly wild and not feral.

Oorial—*Ovis vignei.*

P. 101. No reliance can be placed on horn characteristics, as individual variation is very great even in members of the same herd. In the Kala Chitta Range near Campbellpore, native shikaris recognise two distinct types of horn, and have separate vernacular names for them ; one has a wide spiral with the points turning inwards, the other a close flat spiral with the points diverging outwards.

P. 102. The ruff and beard are not fully developed till early December, being almost entirely shed in the hot weather. I have shot a ram in September in the Punjab Salt Range with as little or less ruff than a Shapu ram shot in the same month at 12,000 feet near Leh in Ladakh.

The colour of the ruff varies in individuals, also of the beard. In a few the beard is snow white and the ruff jet black, making a very handsome contrast ; in others both are grey, but the ruff always darker than the beard. I refer to rams from all parts of the Punjab and from the hills west of the Indus below Attock. I have never seen a Shapu ram in full winter coat, and do not know to what extent the ruff and beard are developed.

Bharal—*Ovis nahura.*

P. 106. The average height at the shoulder is less than 36 inches :—from 34½ to 35 is the average. A Shapu ram is about a 36 inches at the shoulder, and a Bharal is decidely the smaller animal. *Vide* measurements published in Miscellaneous Note No. 7 of the present number.

Asiatic Ibex—*Capra sibirica.*

P. 114. The determination of races is unsatisfactory. I have seen a herd of twenty bucks in Baltistan, no two of which were exactly alike, and which varied from dark brown to whitey-buff with every shade of these colours in patches in some of them. In a few cases they appeared almost piebald. In the Chenab Valley the colour does not seem to vary to such an extent, a light brown being the usual shade, but patchy individuals are frequently met with.

P. 119. Is there an Ibex from N. Sikhim and Lhasa ? I have always heard that the Sutlej forms their S. E. boundary. I have met natives of Lahoul carrying Ibex horns into Tibetan territory, and they may be occasionally seen amongst the loads of the nomad " chumpa " caravans which move annually between Ladak and Tibet. Horns from the Brahmaputra or Ganges catchment area should be very carefully authenticated.

Markhor—*Capra megaceros.*

P. 132. Animals from Sheikh Budin and the hills between Bannu and the Indus are much smaller in body than the Kashmir specimens. The males are ash coloured and have a chin-beard. The rut begins in the last week in October.

Himalayan Tahr—*Capra jemlaicus.*

The normal weight is considerably under 200 lbs., about 180 lbs. A buck Ibex, which stands two inches higher at the shoulder, weighs 200 lbs. *Vide* measurement sent to B. N. H. S.*

P. 136. The purport of this statement is vague, namely, that the habitat of Tahr is hotter than that of the Rocky Mountain Goa Goat. Tahr follow the melting snow up to 11,000 feet, and rarely descend below 8,000 feet till November ; consequently their retention of the long coat is to be expected.

Nilgiri Tahr—*Capra hylocrius.*

P. 138. The saddle-mark is partially seasonal, fading away almost completely in the summer in some specimens.

Black buck—*Antilope cervicapra.*

P. 178. The black fades considerably in all old males in the hot season, but I have noticed that this seasonal peculiarity of colouring is more emphasised in Central and Southern India than in the Punjab. I, however, saw in Patiala in the winter of 1919-20, a large herd of buck containing not less than 6 fully adult males with horns of 21 inches or over, but which did not have a single black one amongst them.

Chinkara—*Gazella bennetti.*

P. 202. The specimens I have seen from the Peshawar Valley have distinctly lyrate horns. I shot one of this type close to Jalezai at the foot of the Cherat hills, and there was another very good example in the Mess at Jamrud which had been killed a couple of miles to the north of the fort.

The height of many specimens I have measured in different parts of India has always been just about 26 inches, occasionally half-an-inch over.

Kashmir Stag—*Cervus kashmirianus.*

P. 211. In a 40-inch 8 pointer shot by me in Kishtwar, the trez tine is missing. In two other large 8 point heads I have seen, the first from the Sind Valley (44 inches) and the second (40 inches) from the Kishenganga, the trez tine is missing in each. The Kishenganga head is an abnormally thick one.

Malay Sambhar—*Cervus unicolor equinus.*

P. 232. The girth of horns seems greater in N.-W. Burma than in the dry zone or the valley of the lower Salwin. These I have seen from Tenasserim are very thin. The two thickest heads I have seen of this sub-species came from the Buxa Duars.

They seem very free from extra points and basal snags as a rule, but I saw a 34½ inch head in a Siamese gendarmerie officers' house at Mesawt (just across the frontier in the Thaungyin Valley) which had eleven points ; the five extra points were three large basal snags and a duplication of each top inner tine. This head came from Karenni.

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* *Vide* Miscellaneous Note No. VII of this issue.

Chital—*Cervus axis.*

P. 236. There was a head measuring 39¾ inches in the Officers' Mess of the Shropshire L. I. in Dinapore, in 1911. This was shot in the Northern U. P., I think in the Ramnagar jungles.

Hog Deer—*Cervus porcinus.*

P. 242. Heads up to 25½ inches have been obtained from the islands in the Irrawadi below Prome.

P. 244. They are to be found in the lower Meping Valley in Siam.

Thamin—*Cervus eldi.*

P. 254. What authority is there for stating that the Siamese race is spotted? I could obtain no confirmation of this in Siam.

Muntjac—*Cervulus muntjac.*

P. 262. (Bottom). In a very old bucks the horns are never shed, but become like polished bone and lose the front tine. I obtained two specimens of this type in May 1914 in the Yamethin district, Burma. May seems to be regular season for shedding the horns, as one buck I shot in that month dropped his horns when he fell, while another had the tips of the pedicels quite raw still.

Tenasserim Muntjac—*Cervulus fea.*

P. 263. The English name seems a misnomer, as *C. fea* is by no means restricted to Tenasserim, and is in fact much rarer than *C. m. grandicornis.*

I saw *C. fea*, on the Tack Plateau on 30-4-20, and am almost certain I saw one on 4-2-20 about half a mile from the same spot. I shot a specimen of *C. m. grandicornis* on the plateau on 2-2-20.

Wild Pig—*Sus cristatus.*

P. 283. I saw wild pig on several occasions in Tenasserim and Siam in the first four months of 1920. They were heavily crested with black, scantily-haired bodies ; and appeared much lighter built and longer legged than any wild pig I have seen in India.

I saw a sounder high up on the East side of the mountain between the west of the Meping about latitude 16 10'N. on 2-4-20.

Tiger—*Felis tigris.*

P. 298. These measurements are unreliable. All old measurements were taken over the curves, some from the *chin* to the tip of tail including the hair, and the tape well pressed down into the loose flesh of the neck and back. I find that a 5'-4" bear stretches 18 inches or more when properly pegged out ; that is without trying to obtain a length measurement to boast about afterwards. Tiger and panther skins certainly do not stretch less. A ten f ot tiger, measured straight could peg out at not less than 11'-8". Mrs. Lawrie Johnstone's tiger may have been 10'-6". General Green's tiger of 11'-11" which only measured 5 inches more when pegged out, is ridiculous. The average Kashmiri shikari will stretch a 5'-6" bear to 7'-4" in pegging out, if left to himself, and the shikari of the plains who has a master with a passion for measuring his sport by inches, will pander to it to the same extent.

In " Tiger-slayer by Order " (Digby Davies) out of over 300 tigers killed, the biggest measured 10'-2½".

Leopard—*Felis pardus.*

P. 317. The illustration is evidently of a badly mounted specimen. No wild leopard ever has a big abdomen. I have never seen one open its mouth to snarl without wrinkling its cheeks and forehead and partially closing its eyes. The cheeks are much too fat and round. The double curve in the tail is most curious. A leopard keeps one continuous curve when waving or raising its tail.

Snow Leopard—*Felis uncia.*

P. 326. The Snow Leopard descends to the villages in winter and preys on the village sheep. It is then that most of the skins are obtained by trapping the animals in pit-falls.

Caracal—*Felis caracal.*

P. 339. I feel sure that " ech " as the vernacular name is due to a misprint. " Ee " in the Ladakhi and Tibetan name for the lynx. I never heard " ec " or " ech ", and it seems to have been adopted in a mangled form by mistake. I do not think the caracal ever crosses the main Himalayan chain, or even penetrates far into the outer hills. It is essentially a beast of a dry country, rock and scrub jungle.

Lynx—*Felis isabellina.*

P. 343. I saw a female with three cubs in the Hanle district, in early August 1911. They were at about 17,000 feet. The cubs seemed very tame, and I could easily have shot the mother but did not want to be burdened with them. They were playing amongst some boortsia scrub in a ravine, and when the mother ran off and stood 100 yards away, the cubs let me get within 20 yards before following her. They seemed about three months old. This species is common in the willow-covered flats of the Shyek and Nubra Valleys, where they live largely on the hares (*L. craspedotis*) which abound. The natives there accused them of killing an occasional lamb or kid from the village flocks. In Rupshu another species of hare (*L. oiostolus*) seems to afford their staple diet.

Indian Civet—*Viverra zibetha.*

P. 348. I shot a specimen of this species near Kawkareik, in Tenasserim, whose skin measured 49 inches.

Wolf—*Canis lupus.*

P. 356. They have increased in numbers of late years in Rupshu and Lahoul, and do much damage to the sheep.

I saw one at midday in August 1911 sitting on the summit of a low hill in Rupshu howling most dolefully. What it was about I cannot think, but his grief was not sufficiently great to make him any less wary than usual, and I failed to get a shot.

I saw a very fine specimen in the Kala Chitta Range in November 1919.

Brown Bear—*Ursus arctus isabellinus.*

P. 372. Many old males seem to take to carnivorous habits in the Autumn. I have known one (September 1905) which regularly raided a sheep fold in the Liddar Valley, Kashmir ; it was eventually killed in the act. Another killed a pony, commencing to eat the unfortunate animal before it was quite dead.

At the end of October 1919 a heavy snowstorm drove the bears down off the Shamshibri Range, and I killed a fine male brown bear and a large female black bear right and left ; on going up next day to look for the mate of the brown, I found her eating her husband's carcase, from which the skin had of course been removed, and shot her. She had a very curious coat, consisting entirely of the fine undercoat or " pushm" which was developed to an unusual length ; there were no long hairs of the usual type except in the region of the face.

Black Bear—*Ursus torquatus.*

P. 383. Black bear raid the flocks very freely in the autumn. At the beginning of September 1905, I was camped close to a big sheep fold which was raided three nights in succession by a couple of black bears. Their method was to burst into the fold and stampede the sheep

into the jungle; then kill them at their leisure. They accounted for 42 sheep in the three nights.

P. 385. The young are born in the winter; two being the usual number, but I have twice seen three; both these latter cases occurred in Kishtwar. In September 1911 I saw a black bear in Chamba Lahoul high up above the Chenab about 15 miles below Trileknath. The natives told me that they are very rarely seen as high up the Chenab Valley as this.

Hares.

P. 341, p. 401. *L. craspedotis* is very common in the Shyok and Nubra valleys. They seem to be very foolish in that region as, in the Hushe nullah, after crossing a ridge they would always wait about 20 yards the other side until I appeared over the top; thus giving me an easy shot. They frequently ran into shallow holes under rocks, and twice they made such a bad choice of refuge that I was able to pull them out with my hand.

Schomburgh's Deer.—*C. schomburgki.*

P. 247. This photo is stated to be of a Schomburgh's Deer, but it appears closely to resemble a young Swamp Deer. I though that only two specimens of Schomburghi had ever reached Europe alive; both going to Berlin. Where did the animal illustrated come from?

C. H. STOCKLEY,
Major,
66th Punjabis.

No. II.—EDITORS' AND READERS' COMMENTS ON NOTES WHICH APPEARED IN PREVIOUS NUMBERS.

Sore-neck in Sambhar. (*Vol. XXVII, No. 4, Misc. Note No. VIII.*)

Mr. J. H. Hutton, Kohima, Naga Hills, has sent us the following remarks in connection with certain subjects referred to under the miscellaneous notes in Vol. XXVII, No. 4 of the Society's Journal. Mr. Hutton's interesting field notes on the Northern Slow Loris will be found included in the paper by Mr. Oldfield Thomas on the nomenclature of that animal on a previous page. With reference to the note on "sore neck" in sambhar he writes, "I have been told by Nagas that it is due to the animals' perpetually rubbing themselves to get rid off ticks. I mention this for what it may be worth. Ticks certainly attack the necks of sambhar, and I have shot sambhar with masses of ticks on the front of the neck, but possibly that was the result rather than the cause."

Hornbills in Captivity. (*Vol. XXVII, No. 4, Misc. Note No. XVI.*)

In another note he writes: "With regard to Hornbills in captivity I have at present two specimens of *Dichoceros bicornis*, though I could hardly describe them as in captivity, as the birds are not and never have been confined. The female is a young bird of this year's brood, and cannot yet fly much, but follows my mali about the compound and garden making a noise like the squeaking of the bellows of a dilapidated harmonium, and that so incessantly that everyone is sick of the sound of her. The male bird is at least 18 months old, and almost certainly a year older than that as the Kukis who brought him to me nine months ago then stated that he was two years old, which at any rate meant that he was more than one year old. He lives absolutely loose about the place, comes on the wing when called, roosts out of doors and is not clipped or impeded in any way. He displays the intelligence of a dog almost and made great friends with a Naga dog of mine, the two playing together every morning. One day when I

had occasion to chastise the dog, I was violently attacked while doing so, by the infuriated hornbill, who had come to the dog's defence. Cooked rice is the staple food of both birds, but when the mulberries were ripe the male bird would touch nothing else and gorged daily till he could eat no more. At any time he prefers fruit and will invade the bungalow in search of it. Cooked meat he will sometimes eat greedily, but not if there is fruit to be had, and the same applies to the raw intestines of chickens. He is fond of hunting for insects in the thatch. He makes little noise, but will reply when addressed."

Indian Hornet (*V. cincta*). (*Vol. XXVII, No.* 4, *Misc. Note No. XXVI.*)

Mr. Hutton also tells us : "With reference to note No. XXVI on *Vespa cincta*, I observed some of these wasps carrying off a species of caterpillar that was present in unusual number on the millet crop last month and doing a great deal of mischief. I have also watched them raiding the nest of a smaller species of wasp, but that, I believe, is of common occurrence. A caterpillar which I took from a wasp was not dead, but was incapable of progression."

Wild Dogs in Burma. (*Vol. XXVIII, No.* 1, *Misc. Note No.* 5.)

Mr. J. P. Mills presented the Society with two wild dog skins regarding which he wrote : " The Assamese wild tribes recognise two distinct types of wild dogs, one a slimmer built animal which is said to hunt in smaller packs and more silently than the ordinary wild dog." This particular race is said to be much rarer than the Common Indian Wild Dog and very much more destructive. There are two recognised species of wild dogs, the Indian *C. dukhunensis* and the Malay *C. rutilans*, the latter is found throughout the Malay Peninsula, Siam, Java and Sumatra, and a specimen has been obtained at Moulmein in Burma. It has never been recorded from Indian limits though its occurrence in N. E. Assam and Upper Burma is possible.

Burmese Races of Serow. (*Vol. XXVIII, No.* 1, *Misc. Note No.* 6.)

Unfortunately only two Serow skins were obtained by the Survey. Both of these were identified as *Capricornis sumatrensis milne-edwardsi*. *C. s. swettenhami* referred to by Mr. Milner is not a Burmese but a Malaccan race.

In the summary of the results of the Mammal Survey published in Vol. XXVII, No. 1 of the Journal. Mr. Wroughton gave a key to the Indian and Burmese races of the Serow based on Mr. Pocock's paper referred to by Mr. Milner. Two races of Serow are described as occurring in Burma :—

Capricornis sumatrensis milne-edwardsi and *Capricornis sumatrensis rubidus*.

C. s. milne-edwardsi is an animal with a brownish black body, and the colour of the legs below the knees and hocks is described as 'rusty.' The type locality is Sze Chuen and other localities mentioned are Pegu, Moulmein, Mt. Muleyit, Tenasserim and N. Shan States.

C. s. rubidus has the head, body and limbs all red. The type locality is Arrakan.

The material from which the various races of Serow have been described is extremely limited, it is only by collecting more material in the localities from which the various types were described that more definite knowledge can be arrived at. What is wanted are complete skin and skulls of the animals accompanied by full particulars as to date, locality, altitudes together with any notes or observations that have been made in regard to changes if any, due to sex, age or season in any given district.

Thamin Horns. (*Vol. XXVIII, No.* 1, *Misc. Note No.* 7.)

The following has been received from Major C. H. Stockley in reference to his note on *Thamin Horns* :—

" Since writing the " *Notes on Thamin Horns* " published in the last number of the Journal, I have had the privilege of seeing two pairs of Thamin horns

belonging to Major-Genl. H.C. Tytler and shot by him in Manipur. The points I noticed in comparing them with Burmese heads were: the beam was much thinner and lighter, the brow-tines made a strong angle with the beam (as in Mr. Thomas's *brucei*), and the brow-tines diverged considerably; whereas in most Burmese specimens they are almost parallel. I mentioned these points to Genl. Tytler and, from what he said and from other heads I have seen, individual variation in such minor characters is as great in the Manipur as in the Burmese Thamin.

Injury feigning habits of Birds. (*Vol. XXVIII, No.* 1, *Misc. Note No. XVI.*)

Several instances have been recorded in the Society's journal of 'injury feigning' practiced by birds when danger threatens the nest. Mr. E. H. Aitken recorded a similar incident in connection with the Southern Red-Whiskered Bulbul (*O. fuscicaudata*) in Vol. XIV, page 162, and Mr. W. Cumming noticed the same feature in the White-cheeked Bulbul (*Molpastes leucotis*), Vol. XIV, p. 611; Major A. Begbie described it in connection with the Bengal Red-whiskered Bulbul (*O. emeria*), Vol. XVII, p. 580, and Mr. W.S. Millard in a footnote records having witnessed similar behaviour in the Madras Red-Vented Bulbul (*M. hæmorrhous*).

The mass of evidence goes to show that the injury feigning habit is practiced generally by Bulbuls of the genus *Molpastes* and *Otocompsa*. A very interesting series of letters were published in the journal as to the reasons for this injury feigning habits of birds. We would recommend reference to D. Dewar's notes, Vol. XVIII, p. 916, and the notes by Major H. Delme Radcliffe, Stanley Pershouse, Major A. Begbie, Vol. XIX, pages 526, 528 and 531.

No. III.—AN INTERESTING PANTHER INCIDENT

(*With a photo.*)

On July the 29th I was after Oorial in the Punjab Salt Range about 40 miles west of Jhelum. It had been raining hard all the morning and most of the night and, though I had been on the hill since seven o'clock, I had seen nothing worth shooting. A little before mid-day the rain stopped and I sat down on the edge of a small plateau to examine the valley in front of me. Immediately on my right were a series of low ridges, and beyond them, and forming the sky-line on my side of the valley, was a large ridge which, with the plateau on which I sat, formed the headlands of a bay enclosing the small ridges. On one of these latter and about 250 yards away appeared five Oorial ewes. I watched them to see if a ram would turn up with them, but they fed to the far side of the sidge and were evidently without a male, so I turned my glasses on the big ridge beyond.

As I did so a large panther glided over the crest and came down the face of the cliff on my side towards me. The first thing I noticed about him was that he looked quite grey with no trace of tawny, and when he passed over the grey strata of sandstone (which is the principal formation of the Salt Range), he was quite invisible except through glasses. I noticed that even through glasses I could not distinguish any spots except on his legs, but that the last fifteen inches of his tail looked entirely black on the upper surface. At once the explanation occurred to me of the " Snow Leopards " I have had reported to me by sportsmen on two or three occasions in—to say the least of it—highly improbable localities. The leopard when killed proved to have an absolutely normal coat and markings.

He had come about 80 of the 600 yards which separated us when he suddenly spotted the ewes. He immediately sat down on his haunches and wagged his tail. Never again shall I believe in the motion of the tail in the cat tribe invariably expressing anger : it was as clear an expression of pleasure as one could see, and it was just like a big dog being shown his dinner. He then evidently mapped out his line of approach and started off, somehow contriving to make himself look about half his real size. As soon as he disappeared from view in a nullah about a hundred yards on the far side of the ewes I began to take a hand. The ewes being on the side of a ridge furthest way from me, I had to cross to the head of the next ridge beyond them. Just as I arrived there I heard a feeble " baa " and a few seconds later four ewes appeared going off the way the panther had come and occasionally looking back towards the ravine below me. Walking a hundred yards down the ridge I soon saw the panther standing over a dead ewe licking its neck. He was only about 70 yards away so I sat down for a shot. As I did so he picked up the ewe by the chest with as little exertion as a cat picking up a mouse, and sprang straight up on to a ten foot high rock above him and began pushing the ewe in amongst the roots of a bush which overhung the top : he exposed his side nicely as he did so and I got him just above the heart, so that he ran twenty yards, collided with the trunk of a tree and rolled down dead.

I have never before had the opportunity of seeing a panther at over a hundred yards, and I was much struck by the evident value of his markings to him in the open at long range. Stigand, in his " Game of East Africa," says that he thinks that this must be so, owing to the fact that leopards are so seldom seen in East Africa in open country where they are known to be numerous.

The measurements of my beast will be of interest in view of recent correspondence. They were :—Straight between pegs, 7 feet 5¼ inches ; over curves 7 feet 5¾ inches ; pegged out skin, 8 feet 11½ inches.

C. H. STOCKLEY, Major.

CHAKLALA, PUNJAB,

12*th August* 1921.

No. IV.—OCCURRENCE OF THE TREE SHREW (*ANATHANA WROUGHTONI*) AT KHANDALLA, POONA DISTRICT.

I gather the occurrence of a Tree Shrew *Anathana* (*Tupaia* of Blanford) in the Ghauts in the vicinity of Bombay was not known until a few years before the war, when a specimen was procured from Matheran (thought an escaped captive at the time). However I sent Mr. Kinnear a skin of a male from the jungle below the "Duke's Nose" in 1914, and have observed the animal repeatedly in Matheran as well as in certain dense and rocky forests just below the top of the Ghauts in the part extending from the "Duke's Nose" to Dhak Fort. I have failed so far to observe it on Sakhopathar Hill or further south along the Ghauts, although very suitable sites occur there, and I have also met with it between Dhak Fort and Bimashanker Hill. It is possible that its distribution is capricious and local, and I understand that with the exception above the nearest known occurrence is in the Eastern Ghauts in Madras Presidency.

As far as my very frequent observations tend to show, the animal is far from being so arboreal as its name seems to imply. I nearly always saw it on the ground, nosing fussily about, and reminding the observer forcibly of a very small mongoose. It also does not seem to have the jerky motion of the tail like the squirrel, nor have I ever seen any in the position, so very characteristic of the squirrel tribe, of clinging head downward to the bark of a perpendicular trunk. Stomach examination produced insects, mostly coleoptera and tiny fragments of bones. I have no doubt that the shrew does not hesitate to attack birds and small mammals on occasions, as I saw one making straight for a wounded Minivet (*Pericrocotus flammeus*) with quite unmistakable intentions.

It is a quick moving and playful animal, and, like the squirrel, an excellent climber. I always found it very shy, and frequenting parts of the jungle with very dense undergrowth of bushes and creepers with rocks strewn in between.

M. SUTER, D.SC.

BOMBAY,
September 1921.

[Three species of Tree Shrew are found in Peninsular India. *A. elliotti* of the Eastern Ghauts; *A. pallida* of the Central Provinces (type from Manbhum, Bengal), and the species referred to by Dr. Suter, *A. wroughtoni* of which the type locality is Surat. The name *Tupaia* has been reserved for the forms of Tree Shrew occurring outside Peninsular India. (See Journal, B. N. H. S., Vol. XXVI, page 29.)—EDITORS.]

No. V.—THE BREEDING OF ELEPHANTS IN CAPTIVITY.

Throughout Burma there are herds of elephants engaged upon the extraction of timber. These beasts are living under conditions dissimilar to those under which the owners keep their animals in India and the domesticated Burma elephant enjoys an almost free life.

Many wild elephants are caught in "keddahs", nooses and traps and their introduction to the semi-free life of the domestic animal is carried through rapidly.

When the timber-working elephant is required for any purpose, the attendant follows up the tracks, unloosens the hobble fetters, rides the beast into camp, when, after a bath and the application of harness, the animal proceeds to work. Work completed for the day, the attendant unharnesses the elephant, replaces

the hobbles, and turns him loose. The beast is then enabled to follow his inclinations and to wander at will amongst the surrounding forest. He secures his natural fodder in the usual way, helping himself to various kinds of grasses, creepers, etc. Should he desire a mud-bath, a sun-bath or a wallow in a pool, there is nought to prevent him. He doses beneath the cool vegetation at will and meets his own fellows and at times passes amongst wild animals. Consequently this comparatively free life permits of the production of young under almost natural conditions.

Forest growth is usually so dense that even a large herd is completely hidden at a short distance and it is extremely difficult to watch the animals without attracting their attention. As no apparent signs are shown by females when in a state of " heat " and because of the denseness of their surroundings, the act of fecundation is comparatively seldom witnessed. A male will remain in close company to the female for a period up to fourteen days when she is in this condition and the difficulty of ascertaining the accomplishment of the act renders the calculation of the period of gestation somewhat vague. In cases in which witnesses reported the act, the period varied from twenty months to twenty-two months. Evans, in his book upon Elephants, refers to reports which extend from seventeen to twenty-four months.

Cases are known in which the sire has been a wild male, but my own experience has never embraced these conditions.

The male elephant on reaching a certain age, developes a peculiar condition called " *Musth* " periodically and this condition is believed to be connected in some way with the desire for sexual intercourse. There are records existing and reports which are irrefutable, proving that male elephants in " musth " enjoy connection when in this condition, but the experiences of the writer prove also that " musth " has little to do with the sexual instinct. In all cases seen and known of personally, the males were never in " musth " at the time.

While in " musth ", a male sometimes becomes bad-tempered and the production of a female to his vicinity will calm him. The advent of the female to another " musth " elephant, will increase his temper, which sometimes grows beyond bounds and the male becomes unmanageable.

I believe the state of " musth " has little or no connection with sexual instinct, but that the female, in some way, conveys her desire to the male.

Should a female be known to be pregnant, she is allowed light work and a longish rest before the calf is expected but, in some cases, calves have appeared unexpectedly while the mother was grazing or even during work. Usually they are born while the mother is roaming loose and soon after birth the little one can stand and stagger. A few hours after birth he can walk. Calves measured shortly after birth averaged two feet ten inches. This measurement is from the ground to the shoulder.

It is curious, but true, that a calf usually adopts a foster mother, who assists the dam in protecting and caring for the calf. Should the foster mother be pregnant, she must be moved or the calf will render the coming of her own calf a hungry one. The departure of the foster mother will be borne with anger and her return welcomed with pleasure by the little one.

Calves soon learn to pluck grasses, etc., and although they will suckle up to three or more years, a continually increasing amount of green fodder is taken. Some believe that suckling is by the trunk, but it is not so. The trunk is curled above the forehead while suckling.

The training of the calf usually begins when he is about five years old, but the Karen, who is the most expert elephant man, has been seen with trained youngsters, which could not have been more than four years old. The little beast is taught to allow himself to be fettered and loosed, to squat down and to rise, etc., until a small saddle is placed upon his back and as time passes a small load is

carried. Their early years are spent carrying loads until they grow sufficiently to permit the dragging of small logs. From this, they develop into the working elephants, which spend their lives in the extraction of timber, the royalty and duty on which places many lacs of rupees into the coffers of Burma.

The Sgau Karens have handled elephants for generations, and numbers of calves have been born to their herds. It is common to meet men who compare their ages with those of their working elephants, and it is sometimes more easy to judge the elephant's age than the man's. Numbers of calves born amongst the herds of elephants employed and owned by large timber working firms are to be seen nowadays, born and bred, trained, worked and growing aged in captivity.

I recently sent you photographs of twin-calves and hope to pass on to you later a photograph of " three generations " and one of a calf less than eight hours old.

At times calves are amusing and at others most exasperating : they are always interesting however.

GORDON HUNDLEY.

MOULMEIN, BURMA,
30*th August* 1921.

The Photo referred to was published in Vol. XXVII, No. 3.

[Col. G. H. Evans in his book " Elephants and their Diseases " says :—

" Male elephants, and very rarely females, on attaining maturity are subject to peculiar periodical paroxysms of excitement, which seem to have some connection with the sexual functions to which the name *musth* is applied by the natives of India and *mon-kyathi* by the Burmans. It is probably analogous to the rut in deer.

Causes.—It occurs both in wild and tame animals, and in the latter is more often met with in highly-fed pampered beasts that receive insufficient exercise. It occurs most frequently in the cold season and may perhaps be due to ungratified sexual desire in some cases, but not always so, since the society of a female by no means always quells or even pacifies animals in *musth.* At other times an animal in *musth* undoubtedly seeks a mate of the opposite sex.

Symptoms.—Musth occurs frequently in some beasts, seldom in others, so that the intervals are variable in different animals and in the same manner so are the symptoms. More or less excitement is usual, but on the other hand some elephants become dull and morose. The behaviour changes, shown by disobedience to commands, trying to break away, or showing violence to man or destructive tendencies and being altogether out of sorts. The temples become puffy, due to swelling of the temporal glands which lie beneath the skin and at this stage is called by many mahouts *kherr musth* ; later an oily discharge exudes from the hole or duct over the gland which is then called *musth* by the natives. When *musth* is established there is often a partial retention of urine, the water dribbling away. As soon, however, as the urine is passed freely the natives consider the dangerous stage over, irrespective of the amount of discharge from the glands.

The attack may last a few days, weeks or months. In some cases cowardly mahouts are said at a certain stage of the attack to administer some species of pumpkin which has the effect of abating the excitement, etc. The effect of such treatment, however, is said to be very prejudicial to the health of the animal. Mr. Petley informs me that once *musth* is established it ought to come on every year although in no particular month, and he has known elephants in which owing to overwork or ill-health the usual occurrence of *musth* has failed, to become useless for work. The only remedy is to set them free for months until *musth* again comes on, after which care should be taken to see such animals are treated with extra care."—Eds.]

No. VI.—NOTES ON THE TSINE (*BOS SONDAICUS*).

(*With a plate.*)

The late Mr. R. Lydekker in his " Game Animals of India " discusses the Tsine at considerable length, and quotes the late C. W. A. Bruce and Major G. P. Evans on the subject. As I have had the advantage of hunting and studying the Tsine after reading these authors, the following notes may be of interest.

I spent June and July 1914 hunting Tsine in the Magwe district of Upper Burma, having previously hunted them in the Yamethin district on the other side of the Pegu Yomas. I subsequently met with them, in 1920, in Siam in the lower Meping valley. In all I have seen over twenty full-grown bulls and as many young ones, and not less than two hundred cows.

Amongst the bulls I found the body colour most variable, but in only one instance, related below, did I see any variation from the usual light chestnut of the cows.

The prevalent colour of the old bulls seemed to be khaki ; blue-grey and the rich bay of a copper-beech being next in order of frequency.

The first bull I saw was red and, though adult, he did not carry a big head ; I am inclined to think that this shade of colour eventually develops into the copper-beech shade. Then I came on two bulls fighting, one of which was grey and the other chocolate brown ; this last being the only bull I saw of this colour. It is remarkable that in this instance, although the torn-up ground and the clots of blood flung about bore witness to the fierceness of the battle, there were no cows near or any trace of their recent presence.

I then saw three khaki bulls in succession and, after them, two which were constantly together and were bay and grey respectively. I spent several weary days hunting these, as the grey bull carried a grand head, but they beat me every time.

Towards the end of June 1914 I had been one day through a previously unvisited tract of forest and seen the tracks of a small herd of four cows, a calf and a young bull. On the way back to camp I crossed the very fresh tracks of a big bull and a single cow coming from the direction where we had seen the first lot of tracks. I took up the tracks and within half a mile came to a stream which the bull and his mate had crossed so recently that the mud was still clouding the water. Going up the far slope I suddenly spotted the legs of a Tsine which was standing behind a large bush about 50 yards away : the head was not visible and only small portions of the back could be seen through the leaves. From what I could see the body-colour seemed uniformly chestnut red and quite unlike any of the numerous cows I had seen before, so, knowing that there was only one of each sex in question, I naturally assumed that this was the bull, waited till part of the shoulder showed clear through the leaves, fired and ran in on the shot. As I did so, to my horror, a large dark-coloured cow rolled down the slope dead. I heard a stick break to my left and, on looking round saw an immense bull standing broadside on to me about 60 yards away and about 40 from where the cow had been. My first thought was, " Where has that buffalo come from ? " for he was dark slaty-blue, carried an immense pair of horns of great girth (certainly bigger than Mr. Tarleton's record pair which I frequently saw in Rangoon) and stood a hand higher than any bull I saw before or after. As he turned to bolt I fired, but did not allow for his swinging off, so the bullet, striking behind the shoulder, passed out of the chest forwards doing little damage. I followed him up and found him lying down a mile on, but he bolted without giving me a chance. I never came up with him again, though I put in two more days after him ; but the ground was hard after a break in the rains and the blood tailed after the first two miles. While following him up on the first evening until me on the small herd whose tracks we had seen and they were now a

TSAINE OR BANTING (*Bos sondaicus*)
Shot at Taungdwin-gyi, U. Burma. Length of Horns 29½ inches

cow less in number ; one of them was a dark chestnut red like the victim of my mistake.

Of bulls seen subsequently, two were red, two dark bay, and four were khaki. The big bull illustrated was one of the latter.

In Siam in April 1920, while travelling in the Meping valley near the head of its feeder the Klong Klung, I came on a herd of Tsine while I was on the march. I was walking a quarter of a mile ahead of my transport and saw the herd about 200 yards below me in some open jungle. It consisted of six cows and two bulls : one bull, a young one of slightly darker red than the cows, the other of most unusual colouring. He was a big beast, but with only a moderate pair of horns ; grey down to his median lateral line and, below that, dark red with the usual white shanks : he seemed much bulkier and less active than the bulls I saw in Burma, and had a slight but decided hump. In fact in build he appeared as much bison as Tsine. I ran down to the herd trying to get close in, as I had only a 12-bore and lethal bullets with me, and by using a fallen tree as cover, got within 20 yards. I tried both barrels and had a miss-fire with each. The herd made off and ran into my transport then turned and bolted, the main body clearing right away but the bigger bull came straight back towards me. I had changed the cartridges and waited till he got within 20 yards of me, then had two more miss-fires. The bull came within ten yards, then pulled up and thundered away in a fresh direction. I was standing in high undergrowth and it was then quite evident that he had not really seen me before, but if I had killed him while he was coming towards me I should have been convinced that he was charging unprovoked. I found that the cartridges were some which had got wet and which I had told my orderly to throw away, but instead he had dried them in the sun and replaced them in my haversac.

That Tsine can be really dangerous the following incident will show.

I was after bison one day in July 1914 in a very remote bit of jungle in the Pegu Yomas, and during the morning repeatedly crossed the tracks of a solitary bull Tsine, which had evidently been living there for a long time. This was curious as I had seen no other Tsine tracks, of bull or cow, for several miles. As I could find no fresh bison tracks I took up some 24 hour old tracks of this Tsine about mid-day, and ran them for nearly an hour to the flat top of a ridge where I decided to have lunch. I had passed the rifle to the Burman gun-bearer and turned round to call up the tiffin-cooli, who was climbing the slope below, when I heard a crashing behind me : I looked back just in time to see a big khaki-coloured bull Tsine launch himself full speed towards me from a clump of small cane about 30 yards away. The Burman tried to bolt with the rifle, and the delay in grabbing it from him brought the bull right on top of me, so that I had difficulty in dodging him. I had intended swinging round and putting a bullet behind his ribs, but he whipped round, extraordinarily quickly for so large an animal, and hunted me in and out of the bamboo clumps so that I finally only just saved myself by diving sideways between two of them while he charged past. He then tried the Burmans and went off just as I had picked myself up in time to fire a hasty shot at him. I hit him a shade too far back but on following him up found he had already lain down twice in less than a couple of miles and I felt certain of getting him, when a tremendous rain-storm broke and washed out all the tracks. I fancy he must have been previously wounded and gone off to recover with, naturally, a rather soured temper. He had fed back on his tracks and had been lying down in the patch of young cane.

This, I may say, is the only personal instance I have ever had, in twenty years of big game shooting, of an unprovoked attack by a wild beast.

A point I have not seen noted with regard to the cows is that the direction of their horns is so much backwards and inwards that the points often cross behind the head in an old female. It is usually stated that the finest bulls are solitary.

Major Evans deals fully with this point in his " Big Game Shooting in Upper Burma ", both as regards bison and Tsine, pointing out that bulls in their prime periodically rejoin a herd, giving two instances from his personal experience. On one occasion in July 1914 I was after a big solitary bull whose habits I knew fairly well. In the early morning I had come across a small herd of four cows and a couple of calves and left them undisturbed. Passing on, about an hour later I found a herd of two small bulls and twelve cows. They fed past within a few yards of me, and then, to make certain that the big bull was not with them, I crawled into the middle of them, but unfortunately selected for cover a bush behind which an old cow was feeding ; the result being a terrific snort in my face and the stampede of the herd. I examined all the tracks, found that the big bull was not with them, and then tried his usual haunts without success. On the way back, at about eleven o'clock, we passed the place again and, I saw some tracks crossing those of the stampeded herd, which on examination proved to be those of the big bull and a single cow. (The bull's tracks were easily distinguishable owing to a slight malformation of one front toe.) I took up the tracks myself and, as the rifle was much in the way in the thick undergrowth, I handed it to the Burman with me, thinking that I knew where the bull would make for. I was wrong, for at the top of the next rise, half a mile on, up rose the bull (a grand khaki fellow) out of the undergrowth while his mate stood some thirty yards from him. The Burman bolted with the rifle and I was left staring at the bull not forty yards distant, feeling an egregious ass and decidedly nervous as to his intentions. After fully fifteen seconds he swung round with a snort and they went off at a fast trot together disappearing to a diminuenda of crashes. On the way home we again passed the first little herd of the morning, and it was now a cow short.

Judging from this experience and the former one with the big " buffalo-coloured " bull, I would say that the big bulls normally live solitary, but periodically join a herd and go off with any cow in it which happens to be in season. I twice came across a solitary pair on other occasions ; in each case the bull was " copper-beech " colour. In every case the cow was lying about 35 yards from the bull, and in both the last-mentioned cases I came on top of her and lost my shot.

It seems probable that June and July are the usual pairing months, and that 10 months is the period of gestation ; all the calves I saw in June seemed to be six weeks to two months old. It also seems possible that twins are occasionally born, as I watched a herd of five cows and four calves lying down on a slope in bamboo jungle one day in June, and the cow lowest on the slope had two calves lying between her legs, tail on to each other, with their heads resting on her shoulder and thigh, respectively.

The measurements of the bull illustrated were :—

Height at shoulder		65 inches.	(Measured shoulder to heel.)
Horns	Length	29½ ,,	
	Girth	15¼ ,,	
	Spread	41½ ,,	

This was an exceptionally big bull. Another bull measured 62 inches at the shoulder.

In the Malay States, Java and Sumatra the old bulls seem to become black, and it seems likely that in Burma the tendency is the same, and that the buffalo-coloured and chocolate bulls were a further stage in this direction of the grey and copper-beech coloured animals. I have already suggested that the red bulls turn darker and become copper-beech ; this is supported by the fact that I never saw a red bull which carried any but a very moderate head.

This theory agrees with the fact that the further south we go towards countries of constant warmth, heavy rainfall and dense forest, the stronger become the melanistic tendencies of the mammals inhabiting them ; but it does not cover

the khaki-coloured bulls. I can only point out that, as far as my personal experience goes and that of others with whom I have discussed the matter, the khaki bulls almost invariably carry a long, wide pair of horns of inferior girth to those of the darker and grey bulls. I must leave it to others to reconcile their existence in the same area with the other types.

Major Evans writes of an encounter he had with black Tsine bulls in Upper Burma, and there is no doubt that such individuals occur occasionally in that country, which points to the cool winter months serving as a check on the melanistic tendency of the males of the species, no such check occurring in the more southerly area of the habitat of *Bos sondaicus*.

I fully agree with Major Evans in thinking an old bull Tsine is one of the most sporting of big game. His fast rate of feeding, disconcerting habit of lying down at odd times in the middle of his morning feed, and the fact that he always selects his resting place so as to look back on his tracks, make him an adversary worthy of every effort and necessitates the employment of unceasing watchfulness and patience. Add the spice of risk which attends the hunting and any sportsman will understand why I place him first amongst the fifty odd species of big game which I have shot.

C. H. STOCKLEY,

Major, 66th Punjabis.

[The biggest Tsine head in our collection, given us by Mr. A. J. A. Jardine measures :—

Length	30	inches.
Girth	15½	„
Spread	41½	„

EDITORS.]

No. VII.—SOME MEASUREMENTS OF BIG GAME.

	Height at shoulder. Inches.	Length. Inches.	Girth. Inches.	Weight. Lbs.
Burhel, *O. nahura* 1 ..	35¾	54½	41½	131
„ „ 2 ..	34½	52½	38½	118
„ „ 3 ..	35	54	39	125
Serow, *C. sumatrensis* ..	38¾	56½	40	..
Tibetan Gazelle, *G. picticaudata*	24	41	26	43
„ „ „ ..	25	42	28	41
Himalayan Ibex, *Capra sibirica*	40	37½	48½	196
„ „ „	37½	35½	46½	188

The above measurements were all taken in the summer of 1905 except the Serow, which was shot in Kishtwar in April 1911. The Burhel and Tibetan Gazelle were shot in Ladakh, the Ibex in Baltistan.

The light weight of the second and bigger gazelle can be accounted for by the fact that I had wounded and lost it two days previously in a snow-storm, and only succeeded in finding and finishing it two days later.

The first Burhel on the list was very much above average size, and had horns 28¾ inches in length.

C. H. STOCKLEY,

Major.

No. VIII.—ABNORMAL IBEX HEAD.

(With a block.)

The enclosed photograph of an abnormal Ibex head would, I think, interest readers of the Journal.

The animal was shot this year in the Shigar Nala, Baltistan, by Lt. D. Gaussen, R.A.F

There was no abnormality observed in the animal which was in good condition.

It will be noticed that the core of the abnormal horn is deflected to the right from where it joins the skull. The shikari, a man of 30 years' experience, informed me that he had never before seen a head of this description.

The two horns measure the same : each 30 inches.

LT.-COL. R. W. BURTON.

BAREILLY,
14*th November* 1921.

No. IX.—AN ADDITION TO THE LIST OF INDIAN BIRDS.

An examination of the series of Bluethroats in my collection obtained in the Punjab has revealed the interesting fact that a new bird has to be added to the Indian list. The ordinary form of Bluethroat which is found in the Punjab plains as a passage migrant, and in a lesser degree winter visitor, is *Luscinia suecica pallidogularis* (Sar). A male obtained by me at Ferozepore on 5th February 1912, however proves to belong to the smaller, paler, form *Luscinia suecica discessa* (Mad.) which is the breeding bird of the Altai. This identification has kindly been confirmed by Dr. E. Hartert and Dr. C. Ticehurst.

A female bird obtained by me at Sirsa on 11th December 1914 also appears to belong to the same race, but the identification of female Bluethroats is

notoriously difficult and it is impossible to speak with any degree of certainty in their case.

HUGH WHISTLER, F.Z.S. C.F.A.O.U.

DHARMSALA, PUNJAB.

[In regard to the generic name of the Bluethroat we would call attention to the footnote, p. 713, Vol. XXVII, where Stuart Baker in his Hand List adopts *Cyanosylvia* (Brehm) instead of *Cyanecula* of Blanford. Hartert however includes *Cyanosylvia*, *Daulias*, and *Calliope* all under *Luscinia*.—EDITORS.]

No. X.—HABITS OF THE SOUTHERN SCIMITAR BABBLER (*POMATORHINUS HORSFIELDI TRAVANCORIENSIS*).

While walking round the estate this morning my attention was drawn to a large gathering of birds at the edge of shola bordering the path. They were a mixed crowd and were making a tremendous noise. I could see no cause for the commotion in the shape of snake, owl, etc., and they seemed merely to have struck a rich supply of food. But what surprised me was that among them, not in the undergrowth but up in the trees, about 50 feet above the ground, was a flock of four or five Southern Scimitar Babblers (*Pomatorhinus horsfieldi travancoriensis*). I have never seen these birds anywhere except skulking in thick cover either under the coffee, or among the lower undergrowth of the jungle and I would never have thought of looking for them at the height these birds were. This " composite flock " consisted of S. Indian Tree-pies, Larger Racket-tailed Drongos, White-eyes, Red-whiskered Bulbuls, Yellow-browed Bulbuls, Orange Minivets, Grey-headed Flycatchers, the Scimitar Babblers and, among, the undergrowth where they *should* have been, were Black-headed Babblers.

A. P. KINLOCH, F.Z.S.

NELLIAMPATHY HILLS,
6th August 1921.

No. XI.—NIDIFICATION OF THE SOUTHERN RED-WHISKERED BULBUL (*OTOCOMPSA EMERIA FUSCICAUDATA*).

On the 22nd November of this year I found a deserted nest of the Southern Red-Whiskered Bulbul containing one egg ·89×·60″, about 4′ up in a coffee tree; on looking up references I was rather surprised to see that Oates gives the breeding season for this bird as " February to end of May and June " (*vide* " Fauna of British India," Birds, Vol. 1 and " Nests and Eggs " Vol. 1) as I recollected having previously found nests during the cold weather as well as in the hot weather (never, up here, in June). Unfortunately I found no reference in my notes.

On the 2nd December I found another nest containing two eggs, ·82×·69″ and ·80×·69″, on which the bird was sitting, so that on these hills the breeding season of this species is November-December and February-April.

A. P. KINLOCH, F.Z.S.

NELLIAMPATHY HILLS,
4th December 1921.

No. XII.—WOODPECKERS " ROOSTING ".

Never having seen a woodpecker " roosting " for the night and finding no information in books, I was curious to know in what position and place these birds repose.

After many evenings spent in fruitless search, last night at dusk I discovered a woodpecker, probably Tickells Golden-backed Woodpecker (*Chrysocolaptes guttacristatus*) which had evidently retired for the night. It was too dark to see its colours but the outline was clearly silhouetted against the sky. It was "squatting " on a branch of an almost leafless *Albizzia stipulata* which went up at an angle of about 45° from the trunk. The bird was in a line with the branch on its upper side ; in fact in the position it would have adopted were it searching for food.

A. P. KINLOCH, F.Z.S.

NELLIAMPATHY HILLS,
5th October 1921.

No. XIII.—PREDACEOUS HABIT OF THE COMMON KING CROW.

The Common King Crow (*D. macrocercus macrocercus*) is not, I think, generally attributed with murderous instincts. He is, of course, a great devourer of winged insects, but rarely, I think, attacks birds. The following incident witnessed by me recently in the vicinity of Dehra Dun must I think have been exceptional.

I noticed a King Crow perched on a low branch of a tree with something in its claws. There were also two fully fledged young King Crows on neighbouring twigs noisily asking to be fed. I approached the group and examined them from a distance of less than 10 yards with my field glasses and to my surprise found that the object held in the claws of the King Crow was a White-Eye (*Zosterops palpebrosa*) with its eye apparently pecked out. The King Crow then became alarmed and flew away with the small corpse in its claws. I did not see it either kill or eat the bird but presume it did both.

B. B. OSMASTON.

PACHMARI, C. P.,
18*th August* 1921.

No. XIV.—NIDIFICATION OF THE CEYLON THRUSH (*O. IMBRICATA*, LAYARD).

It may interest you to know that I have found *Oreocincla imbricata* (Ceylon Thrush) Layard (the Buff-breasted Thrush of Legge) breeding. The nest is placed about 10 feet from the ground in the fork of an *Albizzia* tree which trees are used as shade trees for the tea in this district and are lopped every six months yearly. There is a strip of scrub jungle, out of which the large tumbril has been taken, within about 60 yards. The materials used are green moss and a few fresh fern leaves ; the lining is composed entirely of moderately fine black roots, there is no mud. The whole structure is neat, round and compact, and the cup is fairly deep and very wide. The nest contained 2 eggs, one of which I have taken, but it has not yet been blown owing to having no drill or blower. The size of the egg is 1·25″ × ·95″. The shape is decidedly peg-topped and the colour

is pale-green with faint reddish-brown markings (rather streaky) sparingly scattered over the whole egg but decidedly thicker at the large end. The texture of the shell is fairly smooth and glossy. The birds are fearfully shy, at least the cock is, as I have only had a very fleeting glimpse of him, whereas the hen will let me up to the nest within about fifteen feet. I fancy incubation is fairly far advanced though I cannot really tell until I blow my egg.

When placed in water the egg sank with the large end up, which rather pointed to advanced incubation. I should very much like to know whether this bird has been classed as the same species as *Oreocincla nilgiriensis* Jerdon, or whether it is a good sub-species peculiar to Ceylon. I don't think any records of its nest being found in Ceylon are mentioned either in Hume's Nests and Eggs or Legge's Birds of Ceylon, and I don't think Mr. W. E. Wait out here has any records of it either, he is at home at present so I cannot consult him. I must say it is the first time I have seen this thrush out here, though I *thought* I saw a pair one day close to where the nest *is* now, no doubt I was right. I actually found this nest in July when it was half finished but thought it was an old one so did not look at it again until yesterday, when I saw a bird in the vicinity which I did not know as it looked too big for *Geocichla spiloptera* (The Spotted Thrush) which I know well as they are a fairly common, though little seen, bird up-country. As I thought the bird I saw was a thrush, I immediately connected it with the nest I had found in July and it turned out that I was right, but I little expected to hit on such a rare find, especially at this time of the year and as this is a very wet district, our average rainfall being well over 200 inches. The elevation here is about 3,800.'

T. E. TUNNARD.

CEYLON,
10th August, 1921.

[Stuart Baker, in his "Hand List of Indian Birds " Vol. XXVII. No. 4. p. 720, classes *O. nilgiriensis* and *O. imbricata* as races of the Small-Billed Mountain Thrush, *O. dauma*. The Nilgiri Thrush, *O. nilgiriensis*, as a sub-species is distinct from *O. imbricata* which is confined to Ceylon. Hume's Nests and Eggs of Indian Birds contains no record of the nidification of this Bird.—EDS.]

No. XV.—OCCURRENCE OF THE MALAY BITTERN (*GORSACHIUS MELANOLOPHUS*) AT OOTACAMUND, S. INDIA.

It may be of interest to some of our readers to hear that yesterday, while out shooting small game, my beaters drove out of a shola, on the top of the Sijur ghat, at an elevation of roughly 7,200 feet, a fine specimen of the Malay Bittern (*Gorsachius melanolophus*) which I secured.

I notice in the Fauna of British India that Blanford says it is a rare bird, found only in the hill forests near the Malabar Coast where it is also said to breed, but nothing appears to be known of its nidification.

The description of the bird as given in the Fauna of British India tallies well with my bird though it appears to be somewhat more spotted and freckled with black and white than as stated by Blanford, and he omits one rather curious item from his description, namely a conspicuous, though thin, pinkish-red curved line in the centre of the lower eyelid reaching from front to rear.

I have never seen or heard of this bird in this Presidency before, and my shikari and older beaters, who have been at the job for over 30 years, also tell me they have never before seen such a bird on these hills. I should deem it a favour if

any of our members can and will furnish me with particulars of any of this species they may have met with in the Madras Presidency, especially if possible as regards its nidification.

H. R. BAKER, Lt.-Col.,

I. A. (Retired.)

Ootacamund, Nilgiris,

1st November, 1921.

[Mr. T. R. Bell writing of the Malay Bittern (*G. melanolophus*) Vol. XIV, p. 394 says that "the bird is not rare in the Kanara District, Bombay Presidency, where I have taken many nests. The birds build during the heaviest rains in thick jungle. The nest is always placed in a conspicuous position, (at least it is conspicuous where once discovered, but is easily overlooked) and generally in the terminal fork of a tree ; anywhere from 15′ to 30′ from the ground. I have always found the tops of the hills the surest place for a find and generally at the commencement of a nalla; the birds seem to prefer to have a bit of flat open ground under the nest, but never build them exposed to the sky, the nest being invariably overshadowed by the foliage of a high tree."—Eds.]

No. XVI.—NOTES ON DUCK IN THE RAWALPINDI DISTRICT.

During this hot weather I have been fortunate in obtaining several specimens of duck of different species, as shown in the following list. :—

Date.	*Species.*	*Sex.*	*Notes.*
23rd May 1921..	Common Pochard. (*Nyroca ferina*).	♀♀♀	Three specimens shot out of two flocks of about a dozen birds each.
24th May 1921..	Red-crested Pochard. (*Netta rufina.*)	♂	A solitary drake brought to me alive, slightly winged by shikari who shot him.
3rd June 1921..	Garganey Teal. (*Querquedula circia.*)	♀	Shot out of two small flocks of three and four. Several more seen.
6th June 1921..	Do.	♂	
7th June 1921..	Shoveller. (*Spatula clypeata.*)	♂♀	A pair shot together.
16th June 1921..	Do.	♀	A single bird.
17th June 1921..	Gadwall. (*Chaulelasmas streperus.*)	♂♂	Two shot out of a flock of six. This seems to be the latest appearance on record of this duck.
26th June 1921..	Shoveller.	♂♀	Another pair shot together.
4th July 1921..	Common Pochard.	♀♀	Single birds.
19th July 1921..	Garganey Teal.	♂♀	A pair shot together.
20th July 1921..	Common Pochard.	♂	Shot together out of the
	Red-crested Pochard.	♀	same flock of six birds.

It is very remarkable that on the ovaries being examined not one of the females showed any signs of breeding. In no case could I distinguish any signs of injury, and there can be no doubt whatever that the late stay of these birds is not to be accounted for by the usual theory of their being pricked during the shooting season and unable to fly. All these birds were shot on the Karung River within six miles of Rawalpindi, and it is absurd to assume that they

stayed there otherwise than by their own choice, when Kashmir was within a couple of hours flight of them.

It was noticeable that the first two Garganey obtained had the lower plumage heavily stained with rufous, I suppose from the red mud of the river, and in consequence appear to have been there for a considerable period : the pair shot on the 19th July show no signs of such staining and the inference is that they were recent arrivals. The drake Garganey shot on 6th June 1921 still retained his drooping shoulder-plumes, while that shot on 19th July 1921 had shed them.

All June birds had the secondaries much worn : in the case of the Shovellers they were reduced to the shaft only for the ultimate half of the feathers. I should have expected that the primaries would have shown more signs of wear than the secondaries.

On three different days in July my shikari reported that there were Pintail on the river. He is usually quite accurate in such matters, and is little likely to have made a mistake with such a conspicuous bird. I could not discover any myself, but sent him down with my gun to try and obtain some specimens, and he reported having missed some on 20th July. Baptista (the Society's Collector), who was with him, supports his statement.

Our first heavy rain fell on the 15th of July, and the birds I saw after this date seemed to be quite a different lot to those which had been on the river before. They were about in flocks, the specimens I obtained were in much brighter plumage in spite of the very dirty water in the river, and there were many more birds about. This continued till the end of July when we had heavy and continuous rain. Immediately all the big duck vanished and their place was taken by several flocks of teal, who also disappeared a couple of days later ; this in spite of the fact that very heavy rain continued to fall and conditions seemed particularly favourable for their stay.

It seemed to me that an entirely fresh set of birds passed through at the end of July, and were replaced by a fresh set of teal. If this is correct the question immediately arises, " Where did they come from ? ".

Again why were there so many birds in the driest period of a bad drought, which all disappeared when the conditions became, apparently, more favourable ?

It looks as if many more birds stop down in the plains voluntarily than is usually supposed, and that the drought drove them to collect where there was permanent water ; and that, the heavy rains having filled up their usual small ponds and tanks, they dispersed again.

I put this explanation forward because I cannot think of a better one. Perhaps some other member of the Society will help me out.

C. H. STOCKLEY,

Major, 66th Punjabis.

CHAKLALA, PUNJAB,
28*th August* 1921.

No. XVII.—OCCURRENCE OF THE FLAMINGO (*P. ROSEUS*) IN THE CENTRAL PROVINCES.

Not being able to find any record of the occurrence of the Common Flamingo (*Phœnicopterus roseus*) in the Central Provinces, I write to report that on July 24th last I observed a small flock of 7 of these birds resting on a mud flat in the Gorewara tank near Nagpur. The birds were in beautiful plumage and were

not far from a group of six Painted Storks which they somewhat resembled in the distance.

B. B. OSMASTON.

PACHMARHI, C. P.
14th August 1921.

No. XVIII.—NOTES ON TWO YOUNG INDIAN HORNBILLS.

(*With a plate.*)

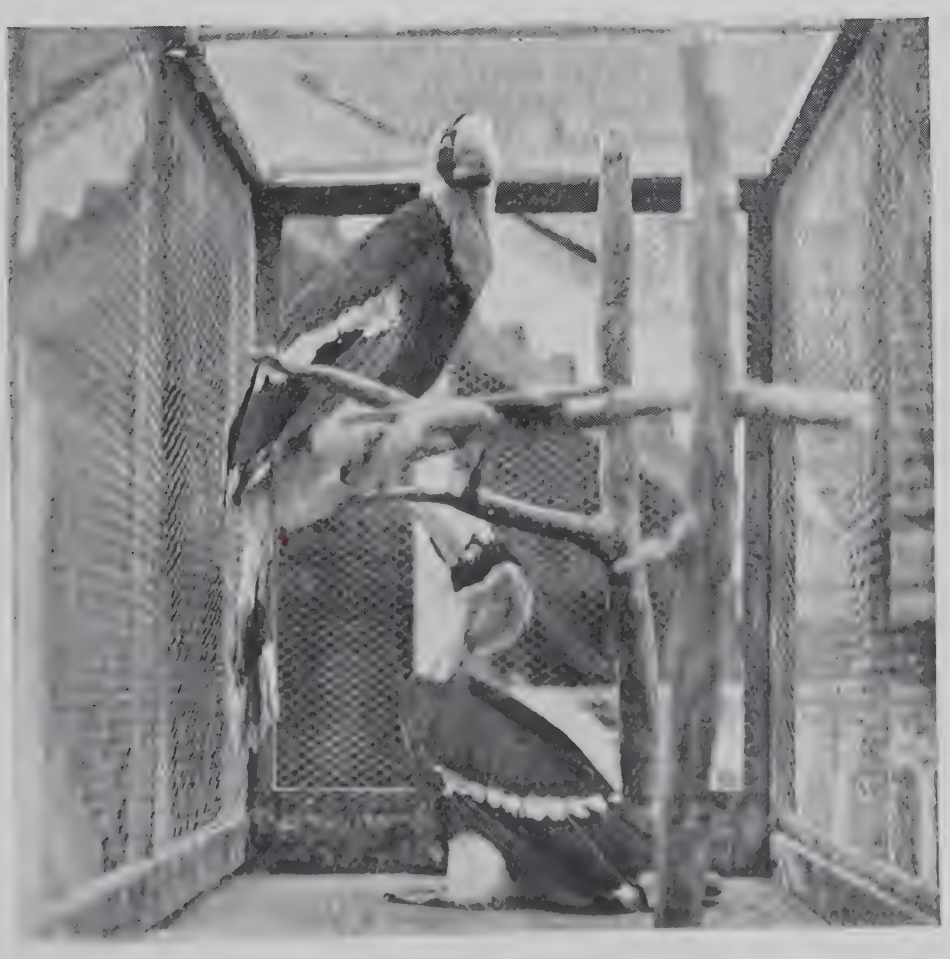
We publish photographs of two young female great Indian Hornbills at present alive in the Society's rooms. They arrived as the result of an appeal by the Hon. Secretary for a substitute for the late lamented "William" who for 26 years, from his cage behind the official chair, was a source of inspiration and encouragement to past Honorary Secretaries of the Society. Both birds are females and have been christened Helen and Joan. Since their arrival they have been fed on a mixed diet of boluses of boiled rice, various species of figs, plantains and an occasional tit-bit of meat a regime on which they have thrived and prospered exceedingly. From the earliest both Joan and Helen were most cordial in their welcome to anyone approaching their cage, they connected the event as a prelude to being fed and signalled their hearty approval with craning necks, quivering distended bills and loud and prodigious croaking. This performance they repeated with infinite gusto at frequent intervals throughout the day. Blessed or cursed with insatiable appetites the mere sound of footsteps passing by their cage would suffice to rouse them from seemingly peaceful slumber to frantic and noisy effort. These demonstrations naturally had a disturbing effect on our Honorary Secretary, who being a busy man and inclined to be wrathful when roused, consigned them frequently to perdition and eventually banished them from the Museum to the work room below. But they have since been restored to favour, as with the passing of infancy came the attainment of more balanced views and a more decorous code of behaviour. Helen and Joan are now content to wait for their meals and do not signalise the occasion by quite so great a display of the emotions.

In colour and markings the birds were on arrival an exact replica of the adult. They were at that time probably but a few months old and had not yet developed the great superstructure of the casque though even at this early stage their bills showed signs of this impending development. The first indication of this was a shallow grove running along each side of the upper mandible and meeting at a point about the middle of the culmen. The profile of the culmen does not however lose the perfect curve till about two months later. When it becomes gradually notched at the apex of the grooves, the portion of the beak bounded by these grooves then takes the appearance of a ridge which develops gradually into the casque. At the present stage the casque is small, flat and pointed in front. In the adult bird it is assumed that the casque, as the name *bicornis* implies, is concave in front ending in two points or ' horns ' but it is interesting to note that while this feature was very evident in a live adult *female* bird sent to the Society by Mr. Tuggersee in March last year, a male specimen which lived with us for 26 years retained a perfectly flat casque up to the time of its death.

Was this an individual variation or is the concavity of the casque a distinguishing feature of the female bird ?

The question arises of what use is the unwieldy appendage to the Hornbill ? Pycraft, in his fascinating book the "History of Birds" in explaining the great length of the beak in Toucans and Hornbills quote, Bates who, writing of the

"Feeding Time."



Joan and Helen.

YOUNG GREAT INDIAN HORNBILLS. (*D. bicornis.*)

Toucan in his *Travels on the Amazons*, says: "It is to enable it to reach and devour fruit while remaining seated and thus to counterbalance the disadvantage which the heavy body and gluttunous appetite would otherwise give it in the competition with allied groups of birds.

The relation between the extraordinary lengthened bill of the toucan and its mode of obtaining food is therefore precisely similar to that between the long neck and lips of the Giraffe and the mode of browsing of the animal. The bill of the Toucan can scarcely be considered a very perfectly formed instrument for the end to which it is applied but nature appears not to invent organs at once for the functions to which they are now adapted, but avails herself here of one already existing structure or instinct, there of another."

However clumsy and heavy the great beak of the hornbill may appear it is, as a matter of fact of astonishing lightness. The horny sheath is very thin and encloses a delicate network of bone the interstices of which are filled with air.

Our 'William ' in health carried his bill with a light and jaunty air and it was only before he died that he sat with his head resting against his back with the beak pointing upwards as though incapable of supporting its weight any longer.

Most people are conversant with the nesting habits of the Hornbills but the reason for the curious mode of nidification is not apparent. General Osborne writing on the subject in our Journal, Vol. XV, page 715, believed that the clue to the mystery was to be found in the fact that the sitting hen moulted the whole of her quill wing and tail feathers during the period of her incarceration and thus in the security of her walled-in nest she was protected and concealed at a time when she would otherwise have been at a great disadvantage. General Osborne discovered this to be the case with a Common Grey Hornbill (*L. birostris*) who had, during the period she was enclosed within her nest, moulted the whole of the quill feathers of her wings and tail.

The question is whether the females of all the various species of hornbills moult in this manner during the period of nidification ?

It is strange that no other writers have commented on this particular aspect of the question as the matter could be easily solved by an examination of the nests. Bourdillon's statement in Hume's Nest and Eggs of Indian Birds seems rather to support General Osborne's contention : describing a hen Great Indian Hornbill pulled off the nest he says " The hen was in such a bad condition that she could not have flown ten yards from the nest until the *young feathers which were just appearing* had matured.

Will members of the Society who have the opportunity, assist in clearing up the point ?

The fact that the hen bird leaves the nest after the young are hatched, rebuilding the enclosing wall and continuing with the help of the cock bird to feed her young, leads one to believe that she wishes to afford them similar protection until they are able to fly and fend for themselves. Mr. D. S. Kaikini who sent us the young live hornbill and whom we questioned on the subject wrote "the mother bird was not inside the nest when the youngster was found in it. It had left the nest before—the mother bird breaks the wall of the nest and rebuilds it leaving a narrow slip for the young bird to thrust out its beak to receive the food she brings. " Describing the taking of the young hornbill Mr. Kaikini said " the two parent birds were hovering about during the operation charging the men and making a continuous roaring noise. The entrance hole was small, $\frac{1}{2}$ inch $\times$ 9 inches just enough for the youngster to thrust out its bill. The entrance looked like a hard plug prepared out of the bird's droppings. This was easily removed and one of the men put his hand in well wrapped round with cloth, and tried to pull out the young bird by its beak but the hollow was found to be too narrow, the hole was eventually widened with axes and the young hornbill removed."

Mr. M. S. Tuggersee writing of the second hornbill says " I visited the tree on the 18th January. The mother bird was locked up in the nest and I could see only the bill from the slit which the male bird provides in the nest for the purpose of feeding the bird during the time of captivity. The egg was not hatched then but early in April the mother bird flew away and the young one was caught on the 17th April. When catching it both male and female parent birds came there and made a tremendous noise but did not come near the man who climbed the tree ". Both Mr. Tuggersee and Mr. Kaikini are of opinion that the birds use the same nests year after year; in fact the nest from which Mr. Tuggersee removed the young hornbill was one from which Mr. T. R. Bell took an egg 20 years previously.

Lastly an interesting point is mentioned by Mr. Pyecraft in regard to the feeding of the hen bird by the male. Writing presumably of the Rhinoceros hornbill (*B. rhinoceros*) Pyecraft says: " During the period of solitary confinement, as we have remarked, she is assiduously fed by the mate and thereby hangs a tale as wonderful as anything in nature wonderful, because her daily rations are passed to her in the form of a bolus, the investing coat being furnished by the inner lining of the gizzard of the male : at least this is the commonly accepted explanation of the structure of the capsule though it is probable that it may prove to be formed by a special glandular secretion when the matter is further investigated. This is the more likely interpretation because according to other accounts each meal is divided into from two to four pellets containing fruit seeds, insects, portions of reptiles which the devoted cock transfers into the gazing mouth of his fair prisoner by a series of jerks." I can find no information as regards this point in connection with the Great Indian Hornbill. In Hume's Nests and Eggs of Indian Birds, Mr. R. Thompson states that he has watched nest after nest and has seen the cock with his throat full of berries coming to the hen and feeding her. Perhaps members of the Society who are interested will be able to throw further light on the points raised in this article.

(1) Is the concavity of the casque in the Great Indian Hornbill a sexual character ?

(2) Does the female undergo a complete moult during the period of nidification ?

(3) In what form is the food supplied by the cock to the sitting hen ?.

S. H. PRATER, C.M.Z.S.

No. XIX.—NOTES ON A FIGHT BETWEEN THE INDIAN SCREECH OWL AND A COBRA.

Sometime ago, whilst stationed at Ferozepore, I had in my possession a pet black cobra, about five feet in length and also some young screech owls.

One afternoon, when the cobra was out for exercise, on the drive of my bungalow, it crawled near to the owlets cage ; suddenly a bird flew past my head and attacked the cobra, giving it a blow with its wing, the bird proved to be an adult owl.

The snake at once coiled up and raised its head at the same time expanding its hood ; the owl hovered in front of the snake, but kept out of reach ; whilst the snake's attention was attracted by the first owl, a second owl attacked it from behind, knocking it down to the ground. The owls then alternately attacked the snake, knocking it down each time it raised its head. After this had happened four or five times, I thought that the snake had been sufficiently troubled for one day and so picked it up ; on examining it I found that its lower jaw

was fractured, so had to kill it. I was sorry to do this as it had been in my possession for several months and was very tame.

It might be of interest to hear whether any of the readers of the Journal have ever seen a similar encounter between a cobra and owls or other birds in the wild state.

J. E. M. BOYD, F.E.S.,
Major, R.A.M.C.

BIRCHINGTON-ON-SEA, KENT,
26th November, 1921.

No. XX.—CROCODILE (*C. PALUSTRIS*) BURYING ITS FOOD.

It may interest you to know of a curious habit which a 6 feet crocodile I am keeping in an enclosure has apparently developed.

Sometime ago I noticed a large mound of earth thrown up on a spot in the enclosure where I had placed some meat for the crocodile but did not pay any attention to it, supposing it to be the work of ants. Last night, however, I was disturbed by the noise of scratching and supposed the crocodile was trying to escape. This morning I found another large mound of earth thrown up and covered with the marks of the crocodile's claws. Digging into this mound with a stick I found two large fish which I had placed in the enclosure in that same place the day before. There were no marks of scratching anywhere else, so I can only conclude that the noise I had heard was that of the reptile burying the fish.

I have never come across a case of a crocodile burying its food before though I have kept many of them. I have always had the meat and fish removed when it began to smell, and as a crocodile prefers its food high, this specimen probably took to burying it in order to outwit me.

There are, as far as I have been able to discover, no beetles or other creatures in the vicinity which would have buried the food and it does not look as if it was the work of insects, to say nothing of the deep claw groves all round and over the mound.

At the same time one would not expect a crocodile to have the intelligence to bury its food. As far as my experience is concerned they appear to be less intelligent than snakes.

Up to now the most I have known crocodiles do with food they did not want to eat at the time, has been to carry it into the water.

A. F. ABERCROMBY.

KOTTAYAM, TRAVANCORE,
13th October 1921.

No. XXI.—HATCHING OF COBRAS (*NAIA TRIPUDIANS*) WITH REMARKS ON THE OODONT, GENITALIA, ETC.

On the 12th of May Mr. J. Flynn, the Honorary Director of the Karachi Museum, greeted me with the news that one of the cobras in captivity had laid eighteen eggs. Two more eggs were laid on the night of the 13th, and one

on the 14th instant, making a total of twenty-one. One egg typical of the rest measured 46×28 mm. ($1\frac{3}{4} \times 1\frac{1}{8}$ inches). The egg is a longish oval with equally rounded poles, white in colour and the shell pliant like white kid.

Knowing from past experience the difficulties of incubating snake's eggs, I advised Mr. Flynn to place them on cotton wool in a tin box with closely fitting lid and to place a sheet of slightly damped blotting paper beneath the wool. Snake's eggs require a slightly damp atmosphere or they dry up. If, on the other hand, the atmosphere is too damp they get mouldy in a day or two and decompose. Every few days the box was opened to ascertain if the blotting paper needed further damping.

I opened one of the eggs on the 19th of June, 38 days (possibly 36) after deposition, and found to my great satisfaction a living female embryo within, that measured 212 mm. ($8\frac{3}{8}$ inches). The tissues were semi-translucent, and the epidermis showed no signs of pigmentation. The abdominal walls were completely sealed, and the heart was observed within, pulsating at the rate of 75 times a minute. There was a feeble attempt at movement on the part of the embryo, which was more pronounced when placed in spirit.

On the 23rd of June (42 days after deposition) I opened two eggs. One contained a male embryo 235 mm. ($9\frac{1}{4}$ inches) in length, with plum-coloured genitalia extruded. This moved very distinctly, and also exserted the tongue. There was some pigmentation of the epidermis, revealing a distinct dark variegation more evident in the anterior part of the body, and a very perfect "spectacle" mark was visible on the hood. The second embryo was a female measuring 241 mm. ($9\frac{1}{2}$ inches). This also moved very obviously. The heart was pulsating 74 times a minute. Investigation showed that the oodont or egg tooth was perfectly developed. It was covered by a layer of mucous membrane.

On June the 26th (45 days after deposition) I opened two more eggs. One contained a male 235 mm. ($9\frac{1}{4}$ inches) long, with the genitalia apparent, and the other a female 254 mm. (10 inches) in length. Each tried to shake itself free from the forceps used to extract them, and emitted the tongue repeatedly. When placed in spirit both struggled violently but aimlessly.

On the 29th of June (48 days after deposition) I opened another egg. The little cobra 279 mm. (11 inches) long, was very lively, erected itself, protruded the tongue, and hissed at me. When consigned to spirit it swam freely, and took fifteen minutes to drown. On this same day inspection of the eggs showed that two were on the verge of hatching. One had several cuts in it, and an open window through which the snakeling could be seen to move. The other egg had two small cuts converging to an angle.

The 30th of June was an eventful day. The windowed egg of yesterday was in process of hatching. The little cobra had about three inches of its length outside the shell. When touched however it withdrew completely.

On the 1st of July, 50 days (possibly 48) after deposition of the eggs, the first cobra of the brood hatched out. This little hatchling was extremely alert, erected itself, expanded the hood and hissed at me violently. It was observed to be very distended, and, after death, the stomach was found to be full of the residual yolk of the egg, amounting to about an eggspoonful. The snakeling measured 260 mm. ($10\frac{1}{4}$ inches). Many of the remaining eggs were obviously decomposed, and I extracted four males and one female varying in length from 190 to 228 mm. ($7\frac{1}{2}$ to 9 inches) all dead.

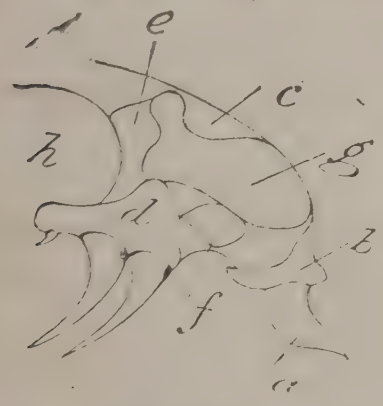
Only one more egg of this brood hatched out, and this happened on the 5th of July, 54 (possibly 52) days after deposition. This hatchling had also eaten the remnant of its yolk.

On the 19th of May another cobra in the Museum deposited twelve eggs, and these were placed under the same conditions as the previous clutch. On the 6th of July (48 days later) four were found hatched out, and a fifth had some inches protruding from the egg. As the box had not been opened the day before,

it is possible some of these hatched out on the 47th day. One of the hatchlings was dead, its naval string twisted and adherent to the yolk mass within. The others were very lively, and all tried to escape from the tin simultaneously, creating some excitement. They proved to be 256, 260, 266 and 285 mm. ($10\frac{1}{8}$, $10\frac{1}{4}$, $10\frac{1}{2}$ and $11\frac{1}{4}$ inches) respectively. Two had undoubtedly eaten the residual yolk, but the other two were not distended, and if they had eaten any of it had done so sparingly.

On the 7th of July the half-hatched snakeling of yesterday was free of its shell but dead, the naval string twisted and adherent to the yolk. This had eaten some of the yolk. It measured 228 mm. (9 inches).

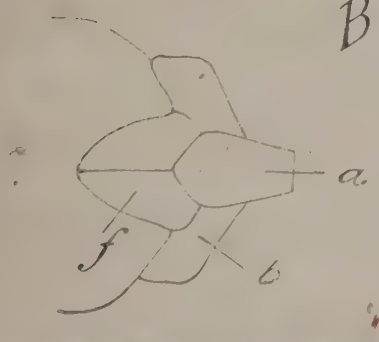
I made the following observations on the oodont or egg tooth. This structure was perfectly developed from 7 to 11 days before the date of hatching. The exact day is uncertain, because the young took from 49 to 54 days to incubate. The oodont was still "in situ" but loose three days after one hatchling had emerged. It is a curiously shaped implement, which structurally appears to be a bone rather than a tooth. Its resemblance to an inverted duck's head is quite remarkable, and it is fixed by the neck into the præmaxillary bone, the bill projecting considerably forwards. The body of the oodont (the head of the duck) is hollow, and its extremity (the bill) is chisel-edged transversely, and directed obliquely downwards and forwards as shown in the figure.



A

When the young cobra is hatched, it is perfectly equipped to carry on an independent existence. The poison gland is well developed, the poison copious, and there are two perfect fangs ankylosed in each maxilla.

The two broods recently hatched clear up the point raised by me some years ago as to whether variety *cæca*, the black cobra without hood marks, is entitled to rank as a variety distinct from variety *typica*. In my popular article on the cobra in this Journal (Vol. XXII, p. 246) I expressed the opinion in a footnote that variety *cæca* is identical with *typica*. I pointed out that in some black cobras there is a perfect "spectacle", though it is obscure, and in others there are usually some black marks or spots on the hood which persist when the rest of the "spectacle" has disappeared. It is only rarely that one finds one of these black cobras without any trace of "spectacle" or binocellus. The snake is so black that these relics of a binocellus are often very difficult to discern.



B

Now the Sind cobra is the black variety, and Mr. Flynn with many years' experience of this Province tells me that he has never seen any other variety. There are several spirit specimens in the Museum, and all black with no indication or very little indication of a binocellus. Both the dams that deposited eggs were black. It is interesting, therefore, to note that the young cobras from both broods were a dull olive-brown with darker variegations, very similar to the common South Indian *typica*, and all bore a very conspicuous black binocellus on the hood. The shape of this spectacle mark, however, is very variable, and many of the young exhibited modifications similar to those I showed semi-diagrammatically in my paper on the snakes of Fyzabad in an

earlier number of this Journal (Vol. XVIII, p. 126). There is no doubt that the black cobra commences life as an ordinary binocellate cobra of the same colour and type that is typical of Southern Indian examples. As it matures it acquires a black colour, and the binocellus tends to become effaced. Why no (?) cobras in Southern India turn black, why all the cobras in Sind and Rajputana do, and why in the United Provinces (Fyzabad) some do and others do not, is an interesting problem that I cannot elucidate.

Some of the observations touched upon in this note confirm previously reported events of the kind, some however do not. The period of incubation does not accord with the only other event of the kind known to me. Eggs laid at Parel on the 12th of May some years ago, hatched out it was reported on the 20th of July. In this case 69 days elapsed from the date of deposition, whereas my two broods hatched between the 47th and 54th days. The conflicting periods are difficult to reconcile when one considers that the climates of Bombay and Karachi are almost identical.

The length of my young cobras 228 to 286 mm. (9 to 11¼ inches) is considerably greater than that reported by Phipson whose hatchlings were only 190 mm. (7½ inches). It would appear from my observations that a young cobra is probably viable after about 45 days in the egg.

The growth during the later stage of intraoval life is rapid, amounting to about 305 to 477 mm. (1 to 1½ inches) in the last week or ten days.

The genitalia of the male are extruded up to about four days before exovation.

The oodont is shed three or four days after postoval life has begun.

The observation that the young snake eats the residual yolk in its egg before vacating it, leads one to speculate why it does so. Because it is hungry? I do not think so, for there is some deposition of fat about the viscera when the young effect their liberty. Does it do so as a provision against a possible dearth of food in its early life? This seems possible because it is a strange fact that in many climates that enjoy a bitter winter (Britain, China) young are born or hatched late in the autumn, and have to face a long period of hibernation at a period of life when they are least prepared for it. Adults at the same period of the year are packed with fat as a provision against the long period of hibernation which often lasts for half the year.

Explanaiion of Figures.

From embryo of *Naia tripudians* 45th day after deposition (Magnified about 10 diametres.)

A Side view of skull.

B Lower „ „ „

(*a*) Oodont, (*b*) Præmaxilla, (*c*) Nasal, (*d*) Maxilla, (*e*) Præfrontal, (*f*) Vomer, (*g*) Nasal cavity, (*h*) Orbit.

F. WALL, Col., I.M.S.

Karachi, 28*th July* 1921.

XXII.—ACQUISITION OF FOUR MORE SPECIMENS OF THE SNAKE (*BRACHYOPHIDIUM RHODOGASTER*, WALL).

In the last issue of this Journal, I described a new snake under the above designation. The locality of the type specimen was not known, but I surmised that it had come from the Palni Hills. This supposition has been confirmed by the acquisition of more specimens. Last year I appealed to Father Anglade, Principal of the Sacred Heart College, Shembaganur, to collect me some of the local snakes at that altitude, about 6,500 feet. The result of his endeavours produced

sixteen specimens, and included four more examples of the new snake. There were ten specimens of *Silybura nigra*, and one each of *Xylophis perroteti* and *Platyplectrurus madurensis*.

The four *Brachyophidium rhodogaster* were all adults. ♂ 185 mm. (7⅜ inches). Ventrals 143. Subcaudals 10 right, 11 left. ♀ 178 mm. (7¼ inches). Ventrals 145. Subcaudals 8. ♀ 178 mm. (7¼ inches). Ventrals 147. Subcaudals 8. ♀ 200 mm. (8 inches). Ventrals 149. Subcaudals 7 right, 8 left. The lepidosis in other respects conforms to that of the type. The last specimen captured as recently as the 22nd of November this year, has the belly suffused with the most intense and beautiful tone of cerise. In the others this hue has faded in spirit to a yellowish colour. The light spot behind the parietals in the type is not noticeable in any of these four specimens.

The largest ♀ captured in November 1920 is gravid, and contained three large eggs which would have been deposited probably that month or December.

I dissected out the skull of this specimen and find the maxillary teeth kumatodont, and 9 in number. The palatine and perygoids are edentulous. The mandibular are kumatodont and number 10.

It is remarkable that a species which is so common that a small collection furnishes four examples, should have escaped the notice of Colonel Beddome. That authority exploited the South Indian Hills, including the Palni Hills to such purpose in the seventies and eighties of the last century, that he has hardly left a snake for any later enthusiast to discover.

F. WALL, C.M.Z.S.,

Colonel, I.M.S.

BANGALORE,

1*st December* 1921.

No. XXIII.—LEECH ATTACKING A SNAKE.

This morning I found a species of *Dryophis* (*dispar* I think) crossing a road separating two fields of coffee. On picking it up, I noticed a small leech firmly attached to and lying along its right superlabials. Snakes and Leeches are both very common here, but I have never before seen a leech using a snake as a medium for quenching its everlasting thirst for blood. The incident was, perhaps, the more remarkable from the fact that the snake was of so essentially an aboreal species. Several species of *Dryophis* are extremely common on the coffee trees as are various species of *Lachesis*, but neither genus is often found on the ground.

A. P. KINLOCH, F.Z.S.

NELLIAMPATHY HILLS,

8*th September* 1921.

No. XXIV.—FOOD OF THE SNAIL (*INDRELLA AMPULA*).

The large pink snail of the Western Ghats (*Indrella ampula*) is very common on these hills and it may be of interest to record its feeding habits.

In nearly all cases I have found this snail feeding on Jack-fruit (*Artocarpus integrifolia*) which had been putrified to a pulp, but on two or three occasions I found it greedily devouring a fungus like growth which occurs frequently on rotten logs but the name of which I am ignorant of.

A. P. KINLOCH, F.Z.S.

NELLIAMPATHY HILLS,
8th September 1921.

No. XXV.—BUTTERFLY FEEDING ON EXCRETA.

With reference to a recent note in the Journal of a butterfly drinking its own excreta, I send you herewith for identification a small butterfly which is at present common in my verandah at Dharmsala (4,000 feet). This morning I watched one of them which had settled on the floor of the verandah ; it kept on bending its abdomen forward and depositing a drop of moisture which it then leaning backwards drank up with its proboscis. This was repeated several times.

HUGH WHISTLER. F.Z.S., C.F.A.O.U.

DHARMSALA, PUNJAB,
12th August 1921.

[The Butterfly sent to the Society by Mr. Whistler has been identified as *Hasora alexis* Fab. (EDS.)]

No. XXVI.—THE BLACK ROCK SCORPION (*PALAMNŒUS SWAMMERDAMI*).

On 22nd July 1921, about 7 a.m., my pankah boy informed me that he had seen an animal go into some water standing in a brick drain into which my bath emptied. He told me that it was a scorpion and I did not believe him, never having heard of a scorpion voluntarily entering water. However, he stuck to it and I went to see. After taking out some broken brick the tail of a scorpion appeared and he was duly captured unharmed. I decided to see if he could really stand water for any time and put him into an enamelled jug three parts full. He, or rather she, displayed no anxiety and assumed the usual sparring attitude but presently relaxed and stayed quiet. Presently I scraped my foot slightly on the concrete floor and she immediately sprang to the defensive attitude. No part of me was touching the table or jug and the sound must have reached her through table and water. She responded to about 3 scrapes and then gave it up.

After sitting quiet for about a quarter of an hour from the time of immersion she set to work quietly to explore her prison and to try and get out. She tried walking up the sides but they were too steep and smooth. Then with tail braced across the jug she worked up the opposite side with front legs and chelæ until the jug by reason of its bulge became too wide for her to span. In doing this, when at greatest stretch, she bore against the side of the jug with the point of her sting so as to get the advantage of the length of vesicle. After several attempts this was given up and she tried bracing herself round the inside curve of the jug and working up sideways. At this she succeeded so well as to get the tarsus joints of top side out of water, but the overhang of the side defeated her and she slipped back. She tried this 3 times and then resigned herself to fate and sat quietly at the bottom. I had to go to office

and left her in the jug. On my return I found her still quiet but resentful of any interference. At six and half of hours from time of immersion I took her out, she was a bit languid at first but resented interference. Ten minutes later she was very fierce and active and remained so until this morning, 48 hours after having been put into the water, I chloroformed her. Research gave me the following particulars: All measurements taken as in Fauna of British India, Arachnidæ, by Pocock. Length in all 136 mm. Carapace 18, tail 82, brachinus 12, width of hand 17, length of moveable finger 19, length of hand posterior lobe to tip of fixed ginger 30. (Pocock does not say how he measured the "under hand.") Sex female, *Palamnœus swammerdami*. Agrees with the description in Fauna of British India except that colour is a good bolster green all over legs and vesicle reddish, qunitæ operculum, pecter sternum yellow (except last segment dark brown to green), pentagonæ, cephalothoracii sternum reddish, tail blackish or almost black green.

A. G. FRERE,
Major, I. A.

St. Thomas' Mount, Madras,
24*th September* 1921.

No. XXVII.—SCORPION COMMITTING SUICIDE.

The following occurrence may be of some interest. It is generally supposed that scorpions if surrounded by fire or if suddenly approached by a bright light will sting themselves to death rather than suffer the agonies of burning. Romanes amongst others in "Animal Intelligence" refers to it as an unique instance of suicide amongst animals. I have frequently tried the experiment and have never succeeded in getting a scorpion to sting itself. In every instance they preferred to be burned and even walked out over the circle of fire. Others who have tried similar experiments have to my knowledge also failed to induce suicide. The story regarding suicide has therefore been largely discredited. The following occurrence would seem to prove however that on occasions scorpions undoubtedly do commit suicide. The other day my wife in moving some papers disturbed a scorpion. Not wishing to kill it and not being certain what it was she confined it in an inverted peg tumbler. I returned within the hour and on removing the tumbler to kill the scorpion found it quite dead. Moreover, the body was swollen to an inordinate size almost to bursting point being quite different in appearance when first confined. When last seen it had been attempting to crawl up the inside of the glass and invariably slipped back, but not in such a way as to make it at all probable that it could have accidentally stung itself. The manner and period of confinement were not such as to make it conceivable that an animal like a scorpion could have died of want of air. Moreover this would not account for the swollen condition of the body. The fluid which had distended the body was of a blackish grey colour giving one the impression that some chemical change in the natural fluid of the body had taken place. Taking all the circumstances into consideration the only possible conclusion seems to be that the scorpion died from poison which was self-inflicted.

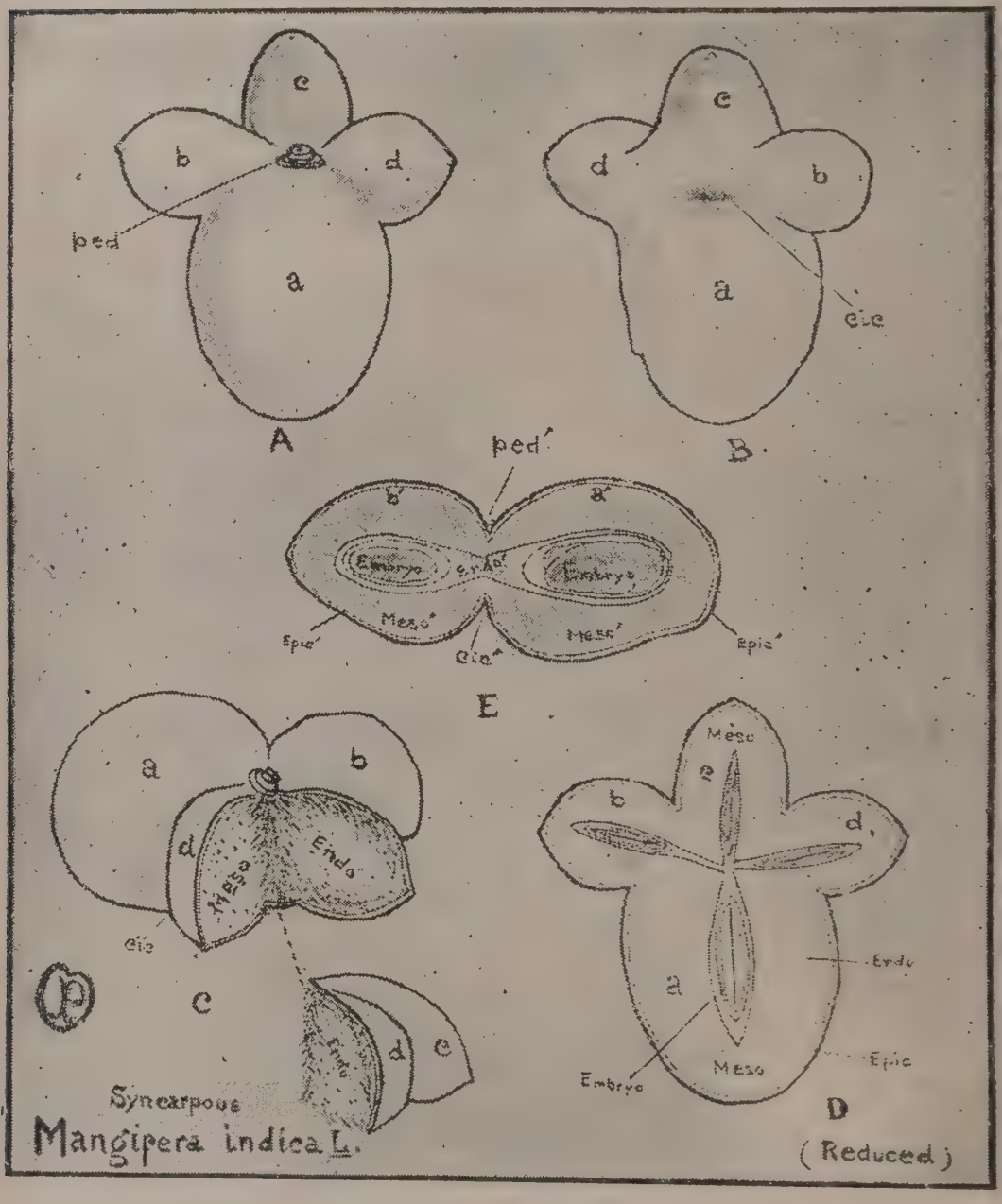
A. A. DUNBAR BRANDER, I.F.S.

Naini Tal,
30*th September* 1921.

No. XXVIII.—A SHORT NOTE ON THE INSTANCES OF SYNCARPY IN MANGIFERA INDICA *L.* AND SOME OTHER TROPICAL PLANTS.

(Read at the Eighth Annual Meeting of the Indian Science Congress).

(With a text block.)



In May last Mr. Surandra Nath Roy of Khetupara, Pabna, sent an interesting specimen (Figs. A-D) in which three small mangoes (b, c, d), of about equal size, were found to have partly coalesced with a big one (*a*). The fruits, having a sub-central common pedicel (ped), were found united by their bases only, the fleshy lobes (a, b, c, d) at the apex being divergent and quite distinct. The intermediate sinuses (cic) between these apical lobes assumed more or less the shape of V.

A few days later, I came across a specimen (Fig. E) in which two mangoes (a′, b′). of sub-equal size, were found to have fused together in the same fashion.

As in both these specimens the position of the pedicels (ped, ped,) was subcentral and as the epicarpic layer (Epic, Epic,) was continuous, it could not, relying simply on superficial examination, be decided whether the phenomena were originally due to adhesion between the pistils of separate flowers or multiplication of the carples or some other cause. So recourse had to be taken to dissection with a view to arrive at a definite conclusion.

On dissecting I found in both these specimens not only the fleshy mesocarpic layer (Meso, Meso,) was continuous, but it will be evident from Figs. C, D and E that there was a definite organic connection, of a tough fibrous nature, between the contiguous endocarps (Endo, Endo,) too. The Embryos in most of these lobes (b, c, d, a, and b,) were found to be either diseased or abortive.

The incomplete union of the fruits by their basal region only and the presence of the divergent apical lobes, lead us to conclude that the pistils and the corresponding pedicels were originally distinct but quite contiguous and the incomplete union between them took place at quite an early stage, thus giving rise to divergence of the apical lobes as growth went on.

Although Syncarpy is of fairly common occurrence, because "Carpels like other parts of the flower, are subject to be united together*" still it must be admitted that the adhesion of such originally distinct pistils indicate, in some degree, a graver deviation than cohesion and is generally a consequence of, or at least is co-existent with, more serious changes†". But in such teratological literature as I have been able to consult, I have not found *Mangifera indica* cited or described in connection with Syncarpy and its allied deviations. This is probably due to the fact that *Mangifera indica*, being confined chiefly to the tropics, does not frequently come under the observation of teratologists most of whom are residents of temperate countries. So the present cases seem to be worth placing on record as instances of Syncarpy.

Besides *Mangifera indica*, complete or partial Syncarpy (*i.e.*, union of fruits or carpels) has been noticed in several other tropical plants. Mention is made below of those only in which I have personally observed such union :—

Rutaceæ ..	.. (1)	Citrus aurantium *L.* (Cohesion of carpels).
Burseraceæ ..	.. (2)	Garuga pinnata *Roxb.*
Meliaceæ ..	.. (3)	Amoora rohituka *W. & A.*
Sapindaceæ	.. (4)	Nephelium litchi *Camb.*
	(5)	Acer spp.
Leguminosæ	.. (6)	Vigna catiang *Endl.*
Combretaceæ	.. (7)	Terminalia chebula *Retz.*
Myrtaceæ ..	.. (8)	Eugenia jambolana *Lamb.*
Cucurbitaceæ	.. (9)	Cucumis melo *L.*
	.. (10)	,, sativus *L.*
Compositæ	.. (11)	Anapalis sp.
Apocynaceæ	(12)	Wrightia tomentosa *Rœm & Schult.*
Solanaceæ	(13)	Lycopersicum esculentum *Mill.*
	(14)	Solanum melongena *L.*
	(15)	Capsicum frutescens *L.*
Euphorbiaceæ	.. (16)	Phyllanthus emblica *L.*
Urticaceæ ..	.. (17)	Artocarpus integrifolia *L. f.*
Scitamineæ ..	.. (18)	Musa sapientum *L.*
Palmæ ..	.. (19)	Cocos nucifera *L.* (Due to polyphylly.)
Gramineæ ..	.. (20)	Zea mays *L.*

No further explanation of the figure seems to be necessary. All figures reduced to $\frac{1}{4}$ size.

P. M. DEBBARMAN, B.SC., F.L.S., M.R.A.S.

* Master's Vegetable Teratology, P. 45.
† ,, ,, ,, P. 32.

No. XXIX.—FOLKLORE OF BIRDS AND BEASTS OF INDIA.

I have been asked by Mr. Ellison to contribute to your Journal this article on folklore of birds and beasts of the country in different parts of India where I have been. I must preface my remarks by stating a well-known truth, to wit, the Indian is not an observant individual, and in my ramblings, except among aboriginals, I have found no help to my curiosity. As a case in point, I was informed, by one of these aboriginals, that the weaver bird (vernacular *Baiva*) is accustomed, in the rainy weather, to squeeze the mud out of the bodies of the ordinary earth worm (vernacular *Kainchua*), which is highly impregnated with phosphorus, and stick it on the side of his nest to light the inside. It is a disputed point whether the lumps of clay found in these nests are for the purpose of balance, or to go one step further, in folklore, to stick fire flies on to. In any case here is a simple problem for naturalists in India.

The Squirrel.

A pretty little story, even though it carries creation to the time of Moses, is common in India. On one of his periodical visits to God, Moses desired to add to creation and God permitted him two efforts. The first clay image made by Moses was the Five-striped palm squirrel, called by many the "tree-rat, "—God admired it and saying "What a pretty creature," stroked it, as He gave it life, and left the imprint of His five fingers.

The second effort was not so successful, he still kept the ground plan of the rat and now put wings on the beast thus making the bat. As the Almighty imbued it with life, Moses, in great excitement, called out "My Lord and God, don't let it fly yet for I have forgotten the anus." "Too late," said God, and thus the bat flies without an anus. This legend but emphasizes the statement I have already made of the want of observation in the Indian, who in the country still believes that the bat emits his excreta from his mouth. It is a common saying in India by a poorly circumstanced host to his guest: "This is a flying fox's feast, I am hanging, you hang too." The expression is built on a story which is as follows. In the world after the creation so as the birds and beasts should recognize one the other, each tribe gave festivals in turn to the rest. All acquitted themselves well until it came to the turn of the flying foxes who, when their guests swarmed into the tope of banyan trees where they lived, said: "Friends, I am hanging, you hang too."

The Peacock.

The Peacock, when first created, had the legs of the Myna, and asked for a change. He was granted his request and when dissatisfied with the result was not allowed to retake his own legs. The result is that to this day when dancing before his mate he sees his ugly feet and screams through agony. The Indian knows that the Peacock breeds during the rains when the tail of the Peacock is from five to six feet in length. This becomes a difficulty to his mind and not understanding how fertilization is accomplished he has evolved a theory of his own. It would appear according to this story that screaming with agony at his ugly legs the Peacock weeps and the lady bird catches his tear drops and generates eggs. Here again will be noticed want of observation, for an ordinary ramble will show the birds up a tree courting one another. These tales of the Peacock are common indistant Japan where a proverb runs: "When all men praise the Peacock's tail, the other birds cry out: 'Look at his legs and what a voice!' In Kangra (Dharamsala, Punjab) the Indian believes the Peacock and Peahen are birds of different species. The Peacock as an emblem of the Lord Krishna, is worshipped throughout India in most parts of which there are strict Government orders against shooting them. The Peahen in Kangra is called a "Bodur", and though she helps the Peacock in propogation by catching the tears of the

Peacock, the Dogra believes that if part of the tear drop reaches the ground a Peahen or "Bodur" is the result. The Dogra of the Kangra Valley will therefore eat the Peahen but not the Cock bird. The tail feathers of a Peacock are believed by Indians, and very many Europeans ("Koi hais") to be unlucky. In India tail feathers made into fans are used by Princes and by Hindus in their religious ceremonies and for "mantras" or charms. In the Kangra the Dogra always places a Peacock's feathers on his leaf umbrella as a charm against lightning, because when lightning was first made it came to earth, and as it twisted and turned along the earth's surface, the Peacock took it to be a snake, swallowed it, thus becoming immune. It is a common cry in Kangra to hear during a storm the Dogras cry out "More More" to frighten away the lightning.

The Owl and the Night Jar.

In Kangra again where folklore of birds and beasts is abundant it is said that the Owl was once naked, hungry and poverty-stricken and it went round and borrowed a feather from each bird. From that day the Owl has never shown his face to his creditors, to whom he had promised repayment, and he skulks till night fall invisible, his voice being that of a ventriloquist. The Owl is called in Kangra "Lingour" and he is bound to be a lucky man who sees the bird. The Night Jar is called in Kangra "Haliya" or ploughman. There was a cruel hard-hearted Zamindar who worked his bullocks all the day and even after sunset. As a punishment in this, his second life, God turned him into a bullock and created the Night Jar who even at night goads on the bullock with his cry Tchk Tchk.

The Crow.

"*Ka karar koota, biswas na karve sota.*" Don't trust the crow, the dog and the Bunnia, even if they be asleep.

"*Ka karar bundi khai. Bahman koota koi nahin sokai.*"

If a Crow or Bunnia finds a good meal, he calls his brethren, but not so the Brahmin, or dog, who calls no one. Here at least, since these proverbs are built on worldly experience, the Indian has condensed his wisdom.

The left eye of a crow shot on Wednesday is used as a love philtre:—Budhwar da Kowa, *viz.*, a Wednesday Crow.

If the Crow touches water or food, the high caste Hindu will partake of neither.

The Pigeon.

The birds once held a contest as to which of them had the best eye-sight The two last contestants were the Pigeon and the Vulture about whom votes were equal. The contestants met "See there that speck in the dim distance?" said the Vulture. "Certainly" answered the Pigeon. "On the right and further away in a ravine lies a dead bullock." Says the Vulture.

"I see it," said the Pigeon, "but under its tail is a lump of dung with many grains of wheat. Do you see them?" "Nonsense," said the Vulture and the whole concourse of birds flew to the carcase and there of course it being the season of harvest was the lump of dung with grains of wheat. It is better to have the sense of deduction than all senses fully and abnormally developed.

The Grackle and Monal Pheasant.

In the Himalayas the Grackle or "Kulchuni" is met and its widespread straddled gait is thus accounted for. Once on a time the birds met to decide which was the earliest riser. The issue lay between the Monal pheasant and the "Kulchuni" The Monal flew down to the Grackle's nest and found him asleep very early in the morning. To have evidence of his victory for the

Punchayet or Council of birds, the Monal sought to close the entrance of the sleeper's nest. A struggle ensued during which the Monal passed through the Grackle's legs thus dislocating the hip joints.

The Grackle borrowed from the Cuckoo some gold and made its golden wattles. The bird never paid and since then in April with unfailing regularity, the Cuckoo comes to the hills to recover his loan but never finds the Grackle who at this season of the year goes up to the higher reaches.

The Myna.

When there is much talk and little doing the Indian calls it a "Jhotari punch" or Myna's cackling.

Mythical Birds in Kangra.

In Kangra there are a pair of mythical birds called the "Koorl" and "Koorli," white in colour. About the ending of July or mid-August these birds are said to arrive on the banks of the Beas river in the State of the Raja of Lambagraon. There on a Seemal or Cotton tree (*Bombax*) they sit. The male and female take it in turns to thus squat week about. While the male is sitting the female bird feeds her mate with fish from the river Beas. If the Koolri or female bird on first going out captures a fish, she brings it back to the Koorl, but if she fails and captures a fish on her *return* journey the Koorl refuses to eat it and drops it on the ground and it is then taken by the Raja's chowkidar to the Raja. If the male bird or Koorl sits first, the first week of the monsoon is ushered in with a deluge. When the Koorli sits the rains are less. If you ask the Raja of Lambagraon he will, as a British chief, tell you the tale is mythical, yet for hundreds of years now the monsoon season is called "Koorlani" from this tale believed in by the people throughout the Kangra for centuries.

The Monal Pheasant.

The shepherds of Kangra are called Gaddies, a very handsome though dirty race of people. Well built and hardy mountaineers they migrate yearly backwards and forwards to and from the snows with their herds made up of an animal which appears to the layman a cross between a goat and a sheep. These sheep find their way in large quantities to the hill stations of Simla and Mussoorie, where the mutton is called "Khadooh."

The crown of the Monal pheasant is used by hill people for ceremonial adornments hence it is that a hill shikari will always bring you a headless Monal and swear you shot his head away.

The Gaddies use the crown feathers of the Monal pheasant in their woollen caps. A hint to those in search of the most perfect decoration for a sweetheart's hat is to get in touch with some one in Kangra where these crown feathers are available in perfect condition at a rupee or Rs. 1-8-0 a crown. I paid Rs. 3 for mine, but it was a bad season.

I will conclude this article written many years ago with a couple of legends existing about the country.

Andreta—The Sal Jungle.

There is a place called in Kangra, Andreta, which in the time of Raja Ranjit Sing, the Lion of the Punjab, had a *pucca* built tank or bathing place which is still existent, proving that in bygone times it was a place of pilgrimage. The legend is that in Ranjit Sing's time there was in this tank a fish with a gold nose ring. Andreta is 5 miles from Palampur on the way up from the plains to Kulu, famous for its fruit. Immediately behind Andreta is a forest of Sal timber unique because it is the only Sal in the Valley.

Legend says that Bhimsen, one of the Pandeva Kings of Delhi, brought a small hill from Hardwar and undertook to carry it to Baijnath which has a very ancient Hindu temple and is to this day a place of pilgrimage. When he

reached Andreta, with the hill, he heard a night bird uttering sounds like a woman pounding rice and thinking it was morning, devoted to such sounds, he dropped the small hill for a while at Andreta but the Sal took root and the hill could not be moved further.

Pappi ka Moolk.

Pappi Ka Moolk or the Country of Sin, otherwise known under its present name of Nirvana, is close to Palampur along the short cut road between it and Dharamsala. It is said in legend that "a long time ago" there dwelt here a king who became enamoured of his own daughter. Fearing the Brahmins he called them in council and put them the following three questions, the answers to which of course by the time serving priests were favourable :—

1. "If I had a valuable article should I keep it or throw it away?"
2. "If I had a valuable mare should I use it in the saddle or throw it away?"
3. "If the mare had a filly should I not use it?"

The chief promptly set about his wedding ceremonies, but on the day of the wedding the whole of this little Kingdom was swept away by God in his wrath.

Most of my jottings emanate from Kangra though some are culled from the United Provinces. Kangra is the only bit of India that escaped Moghal or Mahomedan invasion. The Rajputs of this little bit of India.—Dogras—are the proudest of a proud race, unsullied by Mahomedan blood, and an ordinary petty landhold does not consider it an honour done him if a ruling prince in India chooses his daughter or sister for a bride.

In conclusion, I lay no claim to being a naturalist but only an ordinary observer with the gift of knowing well many dialects spoken in this vast peninsula which, with the exception of Madras, I have wandered over from end to end during a fairly long life.

J. FITZPATRICK.

Ahmedabad.

PROCEEDINGS

OF THE MEETING HELD ON THE 21st DECEMBER 1921 AT THE PRINCE OF WALES MUSEUM.

A private view of the Society's collections in the Natural History Section of the Prince of Wales Museum was held for the members of the Society on Wednesday, the 21st December 1921, between 5 and 7 p.m.

The election of the following 25 members since the last meeting was announced :—Hon'ble Mr. R. E. Holland, C.I.E., I.C.S., Ajmer ; Mr. C. Elphinstone, Nidadavole; Mr. Edmund Perfect, Gooty ; Mr. F. M. Needham, Tezpur ; Mr. J. R. Elton Bott, Mergui ; Dr. R. P. Weldon, M.D., Lumding, Assam ; Major C. B. Mangin, M. C., Meerut, U. P. ; Mr. C. Mc Convay, Trichinopoly ; Capt. E. F. C. F. Weatherly, Saugor, C. P.; Mr. C. E. Parkes, Bombay ; Revd. G. A. A. Wright, Coimbatore ; Mr. Naserwanji Jehangirji Treasurivala, Bombay ; Dr. Wm. J. Wright, Ph. D., Shillong ; Mr. K. L. B. Hamilton, I.C.S., Khandwa ; Mr. G. F. Ball, I. F. S., Rangoon ; The Honorary Secretary, R. A. Mess, Mhow, C. I.; The Honorary Secretary, Royal Artillery Mess, Neemuch , C. I.; Mr. C. P. Skrine, I.C.S., Quetta ; Capt. F. W. Keighley, Bombay ; Capt. R. S. P. Bates, Bellary Cantonment ; The Honorary Secretary, Ahmednagar Club, Ahmednagar ; Mr. F. Dobson, Panposh, B. N. Ry. ; Dr. P. A. Buxton, Palestine ; Mr. B. B. Smith, Matelli P. O. *via* Jalpaiguri ; Mr. C. J. Smith, Dhanbad.

Contributions to the Museum.

Mammals.

1 Himalayan Black Bear (*U. himalayanus*), Bombay ; Supdt., Victoria Gardens.
1 Shan Squirrel (*C. atrodorsalis shanicus*), Tavoy, Burma ; Selim A. Ali.
1 Malay Flying Lemur (*G. peninsulæ*), Tavoy, Burma ; Selim A. Ali.
1 Civet Cat (*Viverra* sp.) Moulmein, Burma ; G. Hundley.
1 Assam Giant Squirrel (*R. gigantea*), Moulmein, Burma ; G. Hundley.
1 Hedge hog (*H. blanfordi*), Kashmir ; F. J. Mitchell.
1 Nepal Ferret-Badger (*H. nepalensis*), Kohima, Assam ; J. H. Hutton.
1 Golden Cat (*F. temminckii*), Kohima, Assam ; J. H. Hutton.
1 Common Bamboo Rat (*C. badius*), Mandalay, Burma ; Assistant Govt. Entomologist.
1 Burmese Mole Rat (*G. vallidus*), Mandalay, Burma ; Assistant Govt. Entomologist.
3 Bats Turjum, Darjeeling ; Oscar Lindgren.
1 Mouse Deer, *Tragulus* memina ; J. Riley O'Brien.

Birds.

1 Nightjar (*C. mahrattensis*), Bahawalpur ; R. C. Bolster.
1 Gadwal (*C. streperus*), Sind ; J. E. B. Hotson.
1 Solitary Snipe (*G. solitaria*), Dajgaon, Kashmir ; Major D. G. Oliver.
1 Black-throated Ouzel (*M. atrigularis*), Binsar, Almora ; S. J. Martin.
1 Black-headed Oriole (*O. melanocephalus*), Ceylon ; W. W. A. Phillips.
1 White-eyed Pochard (*N. ferrina*), Kohima, Assam ; J. H. Hutton.

Reptiles.

1 *Helicops schistosus*, Madras ; Major A. G. Frere.
1 Anamalay Viper (*Lachesis anamalensis*), Kanara ; Mr. C. Mc Cann.

1 Checkered Water Snake (*Tropidonotus piscator*), Kanara; Mr. C. McCann.
1 Common Wolf Snake (*Lycodon aulicus*), ,, ,,
2 Buff-striped Keelback (*Tropidonotus stolatus*), ,,
A few Snakes, Col. F. Wall.
12 Flying Lizards (Draco. *dussumieri*); J. Riley O'Brien.
7 Snakes ,, ,, ,,

Mollusca.

A Small Collection of Shells, Rangoon; Dr. H. H. Marshall.

Minor contributions from:—Major C. Hickie, Mrs. F. B. P. Lory, Mr. D. G Cameron, Mr. Van Ingen, Mr. J. H. Ferguson, Mr. Poole.

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT OF ACCOUNTS from 1st January to 31st December 1921.

RECEIPTS.	Rs. a. p.	Rs. a. p.
OPENING BALANCE ON 1ST JANUARY 1921.		
Fixed Deposit with the Chartered Bank, Bombay	5,000 0 0	
On Current Account with the National Bank, Bombay	1,821 10 11	
Cash on hand	91 6 0	
On Current Account with the National Bank, London, £1,876-10-0 c. 1-4.	28,150 8 0	
		35,063 8 11
Collection of Subscription in arrears	1,110 0 0	
,, Current year's subscription	28,301 4 0	
,, Subscription in advance for 1922, 1923	1,301 0 0	
	30,712 4 0	
Less—Refund of Subscription	223 2 0	
		30,489 2 0
Life Membership Subscription	11,609 8 0	
Entrance fees	1,470 0 0	
		13,079 8 0
Grant-in-aid from Bombay Government	....	15,000 0 0
Registration fees	350 8 0	
Sales of Journals	2,598 15 4	
,, Snake Books	91 12 0	
,, Other printed matters	163 0 0	
,, Pigeons Books (to be paid to Witherby & Co.)	122 12 0	
Receipts from advertisement in Journal	674 5 0	
Sundries	2,373 3 7	
Interest on Investments, etc.	3,396 3 10	
		9,770 13 9
Advance to staff recovered for 1920	300 0 0	
,, ,, recovered for 1921	510 0 0	
		810 0 0
Bank overdraft		592 1 2
		1,04,805 1 10

PAYMENTS.	Rs. a. p.	Rs. a. p.
Journal Account	17,020 15 0	
Salaries	27,332 1 9	
General charges, petty cash, etc.	4,764 2 6	
Rent	3,140 0 0	
Printing and Stationery	2,015 12 9	
Postage	2,196 3 6	
Library Account	333 6 7	
Furniture Account	418 8 3	
Audit fee	250 0 0	
Fire Insurance Premium	318 12 0	
Charges to be recovered	111 9 4	
Birds of Indian Village	36 14 0	
Wild Dog Charts	37 14 0	
		57,976 3 8
Amount spent in connection with snake charts	17,085 3 0	
Less—Amount realised	13,741 5 9	
		3,343 13 3
Amount spent to date in connection with Game Birds	3,855 14 2	
Less—Amount realised in advance	2,292 0 0	
		1,563 14 2
Amount spent on account of Prince of Wales Shooting Trip	....	584 12 0
Amount advanced to staff during 1921	....	925 0 0
BALANCE ON 31ST DECEMBER 1921.		
Investment in 6½% Bombay Development Rs. 8,000	8,200 0 0	
,, 6% Bonds 1926 Pro-Notes	10,000 0 0	
Cash on hand	202 5 9	
Balance on Current Account with National Bank, London, £1,467-5-5 c. 1-4.	22,009 1 0	
		40,411 6 9
On the 31st December 1921 there were outstanding Bills due to the Society for charts supplied amounting to Rs. 615-6-0 and in stock 1,530 hanging charts and 3,239 pocket charts		
Securities with the National Bank of India, Limited, Bombay.		
3½% Govt. of India Pro-Notes		
4 % Govt. of India Conversion Loan	8,800 0 0	
4 % Bombay Port Trust Ung. Bonds	10,000 0 0	
4 % City of Bombay Imp. Trust Bonds	14,000 0 0	
6½% Bombay Development Loan	15,000 0 0	
6 % Bonds 1926 Pro-Notes	8,000 0 0	
	10,000 0 0	
	65,800 0 0	
Postal certificates with the Honorary Secretary	69 12 0	
		1,04,805 1 10

We have seen a letter from the National Bank of India, Ltd., to the effect that the above Securities were held on Society's behalf on 31st December 1921 as also a certificate from the National Bank, London, for the balances with them and the postal certificates.

BOMBAY, 22*nd February* 1922.

Examined and found correct.

(Sd.) A. F. FERGUSON & Co.

(Sd.) H. F. LODGE,
Honorary Treasurer.

(Sd.) A. F. FERGUSON & Co.

MAMMAL FUND ACCOUNT.

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT OF ACCOUNTS from 1st January to 31st December 1921.

	Rs. a. p.	Rs. a. p.		Rs. a. p.	Rs. a. p.
OPENING BALANCE ON 1ST JANUARY 1921.					
Fixed Deposit with Messrs. Cox & Co., Bombay	2,000 0 0		Salary of Mr. Wells	3,400 0 0	
On Current Account with National Bank	1,612 7 4		,, Mr. O'Brien	2,357 3 0	
Cash on hand	15 3 6		,, Mr. C. Primrose	2,104 12 0	
		3,627 10 10	,, Mr. McCann	83 14 0	
Proceeds of B.P.T. Bonds (Rs. 5,000) ..	3,038 5 4		,, Mr. La Personne	108 0 0	
			,, Mr. Amore	392 4 0	
Donations received during 1921	6,809 2 0		,, Mr. Hinton	341 4 0	
			,, Mr. Baptista	1,281 11 8	
Interest on Current Account	77 4 0		,, Raoji Kaneira	259 11 0	
,, Fixed Deposit	44 15 0				10,328 11 8
Government of India Grant	22,500 0 0		Cost of Cartridges	279 13 0	
			Audit fee	30 0 0	
Sundries	33 9 0		Freight on Specimen boxes	190 8 9	
		32,503 3 4	Travelling expenses	2,142 10 0	
			General expenses	1,618 15 5	
			Postage and Telegram charges	129 2 0	
			Collectors expenses	4,688 5 10	
					9,079 7 0
			CASH AND OTHER BALANCES.		
			Fixed Deposit with the Bank of Baroda ..	5,000 0 0	
			6½ % Treasury Bill (Rs. 5,000)	4,912 8 0	
			On Current Account with National Bank ..	6,803 4 0	
			Cash in hand for Postage	6 15 6	
					16,722 11 6
		36,130 14 2			36,130 14 2

BOMBAY, 22*nd February* 1922.

Examined and found correct.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants, Auditors.

(Sd.) H. F. LODGE,
Honorary Treasurer,
Bombay Natural History Society.

NATURAL HISTORY SECTION.

PRINCE OF WALES MUSEUM.

STATEMENT OF ACCOUNT for the year ending 31st December 1921.

RECEIPTS.	Rs.	a.	p.	PAYMENTS.	Rs.	a.	p.
Advance from Trustees, Prince of Wales Museum, to be repaid	3,000	0	0	Amount paid to Bombay Natural History Society for advances on account of cost of preparing the Natural History exhibits for H. R. H. The Prince of Wales' visit and transfer of Collections to Prince of Wales Museum	10,068	11	9
Donation from the Prince of Wales Reception Fund	2,000	0	0	Balance at the end of December 1921	34,931	4	3
Grant from Bombay Government	40,000	0	0				
	45,000	0	0		45,000	0	0

BOMBAY, 22*nd February* 1922.

Examined and found correct.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants, Auditors.

(Sd.) H. F. LODGE,
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PERDIX HODGSONIÆ HODGSONIÆ.

Mrs. Hodgson's Partridge.

(½ life size.)

JOURNAL

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JUNE 1922. VOL. XXVIII. No. 3.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U., C.F.A.O.U.

PART XXXII.

(*Continued from page* 312 *of this Volume.*)

(*With a plate*).

PERDIX HODGSONIÆ HODGSONIÆ

The Tibetan Partridge.

Sæfa hodgsoniæ.—Hodg., J.A.S.B., XXV., p. 165, pl. (1837); (Tsang, Tibet).

Perdix hodgsoniæ.—Gould, B. of A., VI., pl. 74 (1857); Adams, P.Z.S., 1859, p. 185 (Ladak); Leadb., P.Z.S., 1861, p. 198 (Hanlee, Tibet); Hume, Nests and Eggs, p. 544 (1873); Cock. and Marsh, S.F., I., p. 349 (1873); Hume, S.F., VII., p. 432 (1878); Hume and Marsh., Game-B., II., p. 65 pl. (1879); Oates' ed. Hume's Nests and Eggs, III., p. 438 (1890), (Indus Valley); Ogilvie-Grant, Cat. B.M., XXII., p. 194 (1893); id. Hand-b. Game-B., I., p. 150 (1895); Oates, Man. Game-B., I., p. 191 (1898); Walton, Ibis, 1906, p. 218 (S. Tibet); Dresser, Ibis 1906, p. 346 (Tibet); Bailey, J. B. N. H. S., XXI, p. 179, (1911); id. ibid. XXII., p. 367 (1913); id. ibid. XXIV., p. 78 (1915).

Perdix hodgsonii.—Adams, P.Z.S., 1858, p. 503 (N. of Mussoorie); Jerdon, B. of I., III., p. 575 (1863).

Perdix (Sæfa) hodgsoniæ.—Gray, Hand-L., B. II., p. 267 (1870).

Perdix hodgsoniæ hodgsoniæ.—Hartert, Vög., Pal., III., p. 1936, (1921).

Vernacular Names.—*Sakpa* (East Tibetan); *Rhakpa* (Central Tibet); *Che-Tra* (Kongbo Tibetan) (F. M. Bailey).

Description, Adult Male and Female.—Line round the base of the bill black, followed by a white line extending back over the eye as a supercilium; a second black line is followed by the rich chestnut forehead and sides of the crown, the centre of the crown is browner and mottled with black and white; nape and hind-neck greyish brown mottled with white and, to a less extent, with black; a broad chestnut collar at base of hind neck; back, rump and upper tail-coverts blue-grey barred and stippled with black and more faintly with fulvous; the blue tinge is strongest on the inter-scapulars and upper back, and on the latter there are sometimes a few narrow centre lines to some of the feathers; central tail feathers like the upper tail-coverts but more boldly barred, lateral tail feathers chestnut narrowly edged with black stippled fulvous; wing-coverts and inner secondaries with bold central streaks of pale fulvous bordered with black, a few bold bars of deep chestnut and pale fulvous and the rest with fine stippled lines of black, grey and fulvous; quills brown barred with light chestnut and whitish; ear-coverts blackish chestnut with white bases; hind cheeks black; fore cheeks, lores, chin and throat fulvous-white with a black border which joins more or less with the black of the cheeks; fore neck white, or creamy white, with a narrow chestnut band meeting that on the hind neck; below white; the centre of the breast with broad black bars, which sometimes coalesce and form a more or less complete black patch on the belly; sides of breast and flanks marked with chestnut patches and with bold blackish chestnut bars; vent and under tail-coverts pale fulvous or fulvous-white, sometimes marked with tiny bars of speckly black.

Colours of Soft Parts.—Iris brown or red-brown; orbital skin deep velvety crimson in the breeding season, dull reddish-crimson at other times; bill pale horny green; legs and feet greenish brown or pale livid greenish.

Measurements.—Length about 300 mm.; wing 155 to 165 mm.; tail about 86 to 91 mm.; tarsus about 40 to 43 mm.; culmen about 15 to 17 mm.

The Female is like the male but a little smaller; wing about 150 to 155 mm., and the other measurements in proportion.

The Young Bird has no tinge of blue-grey above, the chestnut is wanting everywhere, and the lower parts are a dull earthy buff, the breast with paler striæ and indefinite narrow bars of dull black. The crown, cheeks and ear-coverts are dark brown with white apical spots.

Distribution.—Tibet from the extreme West to the East, where it meets the race *Perdix hodgsoniæ sifanica*, a smaller and much less richly coloured race. On the West it is found in Ladak, and N.E. Kashmir, has been obtained in the N. E. Bhagiratho Valley near Gangotri. It occurs in Kumaon and is not rare in some of the higher valleys of both Native and British Sikkim. It does not occur, as has

sometimes been claimed close to Darjiling, nor is the country there suitable for it. It is found in both the Abor and Mishmi Hills in the extreme North, but does not appear to be nearly so numerous there as it is in Tibet.

Nidification.—The Tibetan Partridge breeds in great numbers over practically the whole of Tibet in suitable ground between 11,000 feet and 15,000 feet. Major Barnes took its nest at an elevation of over 16,000 feet, and Mr. Macdonald has obtained eggs for me at places which he tells me are at about 17,000 feet elevation. Probably its favourite situations are on the huge plateau-plains between 12,000 and 14,000 feet. The nest is nothing more than a scratching in the soil, an inch or two deep, and 6 or 7 inches across; in some wind-blown and fallen leaves and grass may collect in the hollows, but in other cases the eggs are laid directly on the bare soil. As a rule the site selected is one protected by rocks or bushes, sometimes it is scratched in amongst the low thorny bushes which cover so great a part of the Gyantse and similar plains, and sometimes, it may be placed at the foot of a single bigger bush or clump of grass. But the eggs may also be taken on ground which is absolutely devoid of all vegetation, in between a couple of rocks or under some boulder. In all cases, however, the nest is placed on the leeward side of the hill and to the leeward of the bush, rock or other protecting cover. The breeding season commences in the end of May and eggs are laid throughout June and early July, occasional clutches, perhaps second layings when the first have been destroyed, in the end of that month and early August. Prjevalsky found a few eggs laid in early May by *P. h. sifanica* in Kansu, though the hens were not then sitting.

They lay from 6 or 7 to 11 and 12 eggs sometimes, perhaps, even more than this, as Prjevalsky speaks of clutches of 15 eggs and over; probably, however, 8 to 10 is the most common number of eggs laid. In appearance they are very much like the Common Partridge's eggs. The colour varies from a pale reddish buff which is rare, through warm buff, olive buff or reddish olive to a warm, clear olive. The shape is normally a rather long oval, the smaller end well pointed and occasionally becoming almost peg-top in character.

The texture is very close and fine, and there is a faint gloss, rarely very highly developed.

One hundred and fifty eggs average 37·6 by 27·2 mm.; the maxima are 43·0 by 26·3 and 39·8 by 28·4 mm., and the minima are 31·1 by 27·8 and 38·1 by 21·9 mm. The minima exclude certain pigmy specimens which are not uncommon in clutches of this Partridge's eggs.

The hen-bird is said to be a very close sitter and an excellent mother, and the cock-bird an equally attentive father and husband.

Habits.—In summer the Tibetan Partridge is found principally between 12,000 and 15,000 feet, but wanders up to nearly 19,000 feet,

and on the other hand is found down to about 11,000. In winter it keeps below 14,000, and has been found as low as 9,000 feet, though its visits to such comparatively low elevations must be very few and far between.

Hume describes the country in which he found them as very bleak and bare. He says :

> "The entire aspect of the hill where these birds were found was dreary and desolate to a degree—no grass, no bushes, only here and there, fed by the melting snow above, little patches and streaks of mossy herbage, on which, I suppose, the birds must have been feeding."

Colonel F. M. Bailey tells me, however, that the birds do not by preference inhabit the more rugged and bare portions of the Gyantse plain, but are found in places where there are crops, grass or good cover in the way of bushes. In these places they afford good sport, and bags of some size may be made, Colonel Bailey mentioning two days when he obtained 48 and 43 birds in addition to 25 and 34 hares. Elsewhere he records :

> "Found in the crops in the Tsangpo Valley from Pea upwards. They are found in flocks from 10 to 15. Their flight is like that of an English Partridge, but they are not so willing to rise though they are not very wild. When scattered they call each other with a curious buzzing sound. I once heard this exactly imitated by the creaking lid of a lunch-basket which we had out with us when shooting."

Mr. D. Macdonald and others have informed me that when in crops or cover, these birds do not run far, but rise fairly close, and give good shots, though the coveys bunch very much the first time they get up when it is often difficult to avoid "browning" them. After re-alighting they often scatter a good deal, and then afford fine single and double shots, as they rise one after another. When on bare ground, instead of waiting until the shooter is close up to them, they run a great deal, and will often scuttle along in front of one for quite a long distance, stopping every now and then when a dip or hollow in the ground hides them temporarily from view.

It is possible that the bird from the western portion of the range given above, *i.e.*, from Ladak, Kashmir, Garhwal, etc., should be separated as a geographical race. It is much paler than the Tibetan bird, and has little or no bluish tinge above. The broad, rich chestnut collar in that bird is replaced with a narrow yellow-chestnut collar in the Western bird, and the under parts also are paler and duller with the black more extensive and forming a more definite patch. All these variations with the exception of the want of the blue-grey tinge above may be due to bleaching and abrasion, and at present there is not sufficient material in the British Museum to allow of their separation.

Perdix hodgsoniæ sifanica.

The Kansu Partridge.

Perdix sifanica.—Prjevalsky, Mongali Strana Tang. II., p. 124 (1876), (Kansu); Bailey, J.B.N.H.S., XXII., p. 367 (1913).

Perdix hodgsoniæ sifanica.—Hartert, Vög. Pal., p. 1937 (1921).

Vernacular Names.—Sakpa (East Tibet) *Rhakpa*, (Central Tibet) (F. M. B.)

Description.—Similar to *P. h. hodgsoniæ*, but much less richly coloured, the blue-grey tint on the upper parts is either absent altogether or is confined to the upper back or interscapularies. The lower parts also are duller, and there is less chestnut on the flanks and sides of breast. The black on the cheeks is also less in extent than it is in *P. h. hodgsoniæ*, and never meets below the throat.

Colours of Soft Parts as in the preceding bird.

Measurements.—This is a smaller bird than the last, the wing measuring from 140 to 153 mm., with the other measurements in proportion.

Distribution.—N. E. Tibet, Nanschan, Koko Nor to Scetzschuan.

Nidification.—Eggs taken by Tibetans in extreme North-East Tibet and sent to me by Mr. D. Macdonald are quite indistinguishable from those of the Tibetan Partridge. Prjevalsky found young birds in August in Kansu, but the birds were not sitting in early May, and had only commenced laying.

Habits.—Similar to those of the last bird. Bailey found it between 12,500 and 15,000 feet at suitable places at Litang to Dokeng in the Upper Irrawaddy Valley.

Prjevalsky records:

> "We found this bird in the Alpine regions of Kansu (it does not extend further northwards), principally in the rhododendron thickets about the sources of the Tutunga, where the mountains are covered with small tufts of *Potentilla tenuifolia*. It descends to the plains, which, however, are not at a lower elevation than about 10,000 feet above the sea level.
>
> "Its habits are very similar to those of *Perdix barbata*, only the voice is different. When taking to wing, it utters a more squeaking but louder note than this latter, and its call note is also harsher."

Other observers have noted that the ordinary nuptial call of the breeding male is very like that of *Perdix perdix*, if indeed it is in any way distinguishable from it.

Both this and the last bird eat almost any sort of seed or insect, and for the table Colonel Bailey tells me that he cannot see much difference between *Perdix hodgsoniæ* and the English Partridge.

(To be continued.)

HAND-LIST OF THE "BIRDS OF INDIA."

BY

E. C. Stuart Baker, f.l.s., f.z.s., m.b.o.u.

Part VI.

(*Continued from page* 333 *of this Volume.*)

ORDER STRIGES.

Family Strigidæ.

1535. (1152) ***Tyto alba javanica.** *The Indian Barn-Owl.*

Strix javanica *Gmel., S.N., i., p.* 295 (1788), (*Java*).

The whole of India, Ceylon, Burma to Java.

1536. (1152) **Tyto alba deroepstorffi.** *The Andaman Barn-Owl.*

Strix deroepstorffi *Hume, S.F., iii., p.* 390 (1875), (*Andamans*).

Andamans.

1537. (1153) **Tyto candida.** *The Grass-Owl.*

Strix candida *Tickell, J.A.S.B., ii., p.* 572 (1883), (*Borabhum*).

The greater part of India except the W. and N. W. East to Formosa, etc.

1538. (1154) **Photodilus badius badius.** *The Bay Owl.*

Strix badia *Horsf., Res. Java., pl.* 37 (1824), (*Java*).

Eastern Himalayas from Nepal to Assam, Burma to Java and Borneo.

1539. (1155) **Photodilus badius assimilis.** *The Ceylon Bay Owl.*

Phodilus assimilis *Hume, S.F., i., p.* 429 (1873), (*Ceylon*).

Ceylon only.

1540. (1156) **Asio otus otus.** *The Long-eared Owl.*

Strix otus *Linn., Sys. Nat.*, 1, *p.* 92 (1758), (*Sweden*).

Practically all Europe and Asia.

1541. (1157) **Asio flammeus flammeus.** *The Short-eared Owl.*

Strix flammea *Pontoppidan, Danske Atlas, i., p.* 617, *xxv.* (1763), (*Denmark*).

Practically all Europe, N. Africa, N. America and most of Asia.

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*The generic term *Strix* was first applied to birds of another genus (the Tawny Owls) and not to the Barn-Owls. *Tyto* of Billberg. 1828 is the next name available for this genus and *Strix* must replace *Syrnium* of Savigny for the Tawny-Owls or Wood-Owls.

1542. (1158) **Strix aluco nivicolor.** *The Himalayan Wood-Owl.*

Syrnium nivicolum *Blyth, J.A.S.B., xiv., p.* 185 (1845), (*Himalaya*).

Himalayas from Garhwal to China, and N. Burma.

1543. (1159) **Strix aluco biddulphi.** *Scully's Wood-Owl.*

Strix biddulphi *Scully, Ibis,* 1881, p. 423 (*Gilgit*).

N. W. India from Afghanistan and Baluchistan to Kashmir and Garhwal.

1544. (1160) **Strix indranee indranee.** *The Brown Wood-Owl.*

Strix indranee *Sykes, P.Z.S.,* 1832, *p.* 62 (*Deccan*).

Ceylon and Hills of S. India, N. to Mahableshwar and Orissa.

1545. (1160) **Strix indranee newarensis.** *The Himalayan Brown Wood-Owl.*

Ulula newarensis *Hodg., As. Res., xix., p.* 168 (1836).

Himalayas, East to Assam and the Hills of N. and Central Burma.

1546. (1160) **Strix indranee maingayi.** *The Malay Brown Wood-Owl.*

Syrnium mungayi *Hume, S.F., vi., p.* 29 (1875) (*Malacca*).

Tennasserim.

1547. (1161) **Strix occellata.** *The Mottled Wood-Owl.*

Syrnium occellatum *Less., Rev. Zool.,* 1839, *p.* 389 (*Pondicherry*).

The Plains of India to the extreme S. and E. to Lower Bengal.

1548. (1162) **Strix seloputo.** *The Malayan Wood-Owl.*

Strix seloputo *Horsf., Trans. Linn. Soc., xiii., p.* 140 (1821), (*Java*).

South Burma from Pegu, South to Java, etc. and E. to Siam and Cochin China.

1549. (1163) **Strix butleri.** *Hume's Wood-Owl.*

Asio butleri *Hume, S. F., vii., p.* 316 (1878), (*Omara Mekran Coast*).

Mekran Coast and ? Sinai.

Sub-family BUBONINÆ.

1550. (1164) **Ketupa zeylonensis zeylonensis.** *The Brown Fish Owl.*

Strix zeylonensis *Gmel., Syst. Nat., i., p.* 287 (1788) (*Ceylon*).

Ceylon, India, East to South China and Hainan, nearly all Burma.

1551. (1164) **Ketupa zeylonensis nigripes.** *The Himalayan Brown Owl.*

Caltrunguis nigripes *Hodg., J.A.S.B., v., p.* 364 (1836), (*Nepal*).

Himalayas from Afghanistan to E. Assam.

1552. (1166) **Ketupa javanensis javanensis.** *The Malay Fish Owl.*

Strix javanensis *Horsf., Trans. L.S., xiii., p.* 141 (1821) (*Java*).

South Burma and Malay Peninsula to Java, Sumatra and Borneo.

1553. (1165) **Ketupa javanensis flavipes.** *The Tawny Fish Owl.*

Caltrunguis flavipes *Hodg., J.A.S.B., v., p.* 364 (1836), (*Nepal*).

Sub-Himalayas from Kashmir East to Assam, Manipur, N. Burma to China.

1554. (1167) **Bubo bubo turcomanus.** *The Turkestan Great Horned Owl.*

Strix turcomana *Eversm., Add. Pall. Zoog. Rosso-As., i., p.* 3 (1835), (*Caspian Sea*).

Transcaspia, Turkestan to N. W. Himalayas.

1555. **Bubo bubo tibetanus.** *The Tibetan Great Horned Owl.*

Bubo bubo tibetanus *Bianchi, Bull. B.O.C., xvi., p.* 69 (1906), (*Chitsu, Tibet*).

Central Tibet to Nan Schan, S. to Sikkim.

1556. (1168) **Bubo bubo bengalensis.** *The Indian Great Horned Owl.*

Otus bengalensis *Frankl., P.Z.S.*, 1831, *p.* 115 (*Bengal*)

India from the South to the Sub-Himalayas and N.E. Burma.

1557. (1169) **Bubo coramandus.** *The Dusky Horned Owl.*

Strix coramanda *Lath., Ind. Orn., i., p.* 53 (1790), (*Coromandel Coast*).

All Central and North India as far East as Bengal.

1558. (1170) **Huhua nipalensis.** *The Forest Eagle-Owl.*

Bubo nipalensis *Hodg., As. Res., xix., p.* 172 (1836), (*Nepal*).

Himalayas and Mts. of S. India, Ceylon, Assam and Burma.

1559. (1171) **Huhua orientalis.** *The Malay Eagle-Owl.*

Strix orientalis *Horsf., Trans. L.S., xiii., p.* 140 (1821). (*Java*).

S. Tennasserim, Malay Peninsula to Sumatra, Java and Borneo.

1560. (1172) **Nyctea nyctea.** *The Snowy Owl.*

Strix nyctea *Linn., S.N., i., p.* 93 (1858), (*Sweden*).

Mardan, N.W. Punjab. Northern Europe and Asia.

1561. (1173) **Otus scops pulchellus.** *The Eastern Scops Owl.*

Stryx pulchella *Pall., Reise Prov. Russ. Reich., i., p.* 456 (1871), (*Volga*).

S. Eastern Russia, straggler into N.W. India.

1562. **Otus scops sunia.** *The Indian Scops Owl.*

Scops sunia *Hodg., As. Res., p.* 175 (1836), (*Nepal*).

North and Central India.

1563. **Otus scops rufipennis.** *The Southern Indian Scops Owl.*

Scops rufipennis *Sharpe, Cat. B.M., ii., p.* 60 (1875), (*Madras*).

Southern India.

1564. **Otus scops nicobarica.** *The Nicobar Scops Owl.*

Ephialtes nicobaricus *Hume, S.F., iv., p.* 283 (1877), (*Nicobars*).

Nicobars.

1565. **Otus scops minutus.** *The Ceylon Scops Owl.*

Scops minutus *Legge, A.M.N.H.*, (5), *i., p.* 175, (1878), (*Ceylon*).

Ceylon only.

1566. (1174) **Otus brucei.** *The Striated Scops Owl.*

Ephialtes brucei *Hume, S.F., i., p.* 8 (1873), (*Bombay*).

West Turkestan, Afghanistan, Baluchistan and Kashmir, S. to Bombay.

1567 (1175) **Otus spilocephalus.** *The Spotted Himalayan Scops Owl.*

Ephialtes spilocephalus *Blyth, J.A.S.B., xv., p.* 8 (1846), (*Darjiling*).

Himalayas, Murree to E. Assam, N. and Central Burma.

1568. (1178) **Otus bakkamœna bakkamœna.** *The Collared Scops Owl.*

Otus bakkamœna *Pennant, Ind. Zool., p.* 3 (1769), (*Ceylon*).

Ceylon and S. India.

1569. (1176) **Otus bakkamœna balli.** *The Andaman Scops Owl.*

Ephialtes balli *Hume, S.F., i., p.* 407 (1873), (*Andamans*).

Andamans.

1570. **Otus bakkamœna lempiji.** *The Malay Scops Owl.*

Scops lempiji *Horsf., Trans. L.S., xiii., p.* 140 (1821), (*Java*).

Tennasserim, South to Burma.

1571. **Otus bakkamœna lettia.** *The Nepal Scops Owl.*

Scops lettia *Hodg., As. Res. xix., p.* 176 (1836), (*Nepal*).

Nepal and Garhwal to E. Assam amd N. Burma.

1572. (1179) **Otus bakkamœna plumipes.** *The Kashmir Scops Owl.*

Ephialtes plumipes *Hume, My Scrap-book, p.* 397, (1870), (*Murree*).

N. W. Himalayas.

1573. **Otus bakkamœna semitorques.** *The Japanese Scops Owl.*

Otus semitorques *Temm. & Schl., Siebold's Faun., Jap., p.* 25 (1850), (*Japan*).

Japan Southwards. Very doubtful record from Shan States.

1574. ***Otus bakkamœna deserticolor.** *The Sind Scops Owl.*

Otus bakkamœna deserticolor *Ticehurst, Bull. B.O.C., xlii., p.* 57 (1922), (*Sind*).

Sind, Baluchistan, ? Muscat and Bushire.

1575. (1177) **Otus sagittatus.** *The Large Malay Scops Owl.*

Ephialtes sagittatus *Cass., Pro. Ac. Nat. Sci. Phila., iv. p.* 121 (1850), (*India, Perak*).

Tennasserim, South down the Malay Peninsula.

1576. (1180) **Carine noctua brama.** *The Indian Spotted Owlet.*

Strix brama *Temm., Pl. Col., pl.* 68 (1823), (*India*).

All India N. of 14°, except extreme N. E. Assam and N. Chin Hills.

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* This bird may be *Scops semenowi* Zarudy and Harm., Orn. Monatsb., **X**, p. 49, 1903.

1577. **Carine noctua fryi.** *The Southern Spotted Owlet.*

Carine brama fryi *Stuart Baker, Bull. B.O.C., xl., p.* 60 (1919), (*Paumbaum, Madras*).

Mysore, Travancore, Deccan, Madras, and Bombay N. to 14°.

1578. **Carine noctua pulchra.** *The Burmese Spotted Owlet.*

Athene pulchra *Hume, S. F., i., p.* 469 (1873), (*Pegu*).

Central and S. Burma, Shan States, Siam Yunnan, Cambodia.

1579. (1181) **Carine noctua blewitti.** *The Forest Spotted Owlet.*

Heteroglaux blewitti *Hume, S. F., i., p.* 468 (1873), (*Phooljan State, W. India*).

Sambulpur, Karial, Khandesh (forests).

1580 (1182) **Carine noctua bactriana.** *Hutton's Owlet.*

Athene bactriana *Hutton, J.A.S.B., xvi., p.* 776 (1847), (*Candahar*).

A straggler only into N.W. India on the Afghan frontier.

1581. **Carine brama tarayensis.** *The Baluchistan Spotted Owlet.*

Noctua tarayensis *Hodg., As. Res., xix., p.* 275 (1836), (*Nepal Terai*).

N. W. India, Baluchistan, Sind and Persian Baluchistan.

1582. (1183) **Glaucidium cuculoides cuculoides.** *The Large Barred Owlet.*

Noctua cuculoides *Vigors, P.Z.S.*, 1830, *p.* 8 (*Himalaya*).

From Hazara to Assam, Burma and Siam.

1583. (1184) **Glaucidium radiatum radiatum.** *The Jungle Owlet.*

Strix radiata *Tickell, J.A.S.B, ii., p.* 572 (1833).

India from the foot of the Himalayas and S. to Madras and Belgaum.

1584. **Glaucidium radiatum malabaricum.** *The Malabar Jungle Owlet.*

Glaucidium malabaricum *Sharpe, Cat. B.M., ii., p.* 218 (1883), (*Malabar*).

Malabar Coast to Ceylon and N. Ceylon.

1585. (1185) **Glaucidium radiatum castanonotum.** *The Chestnut-backed Owlet.*

Athene castanopterus *apud Blyth, J.A.S.B, xv., p.* 280 (*nec. Horsf.*), (1846), (*Ceylon*).

Ceylon in the wetter, hilly country.

1586. *(1186) **Glaucidium brodiei.** *The Collared Pigmy Owlet.*

Noctua brodiei *Burton, P.Z.S.*, 1835, *p.* 162 (*Himalayas*).

Himalayas, Murree to E. Assam, Burma, China and Malay Peninsula.

1587. (1187) **Ninox scutulata lugubris.** *The Indian Brown Hawk-Owl.*

Strix lugubris *Tickell, J.A.S.B, ii., p.* 572 (1833), (*Dholbhum, Bengal*).

N. India from Rajputana to Bengal.

1588. **Ninox scutulata burmanica.** *The Burmese Brown Hawk-Owl.*

Ninox burmanica *Hume, S. F., iv., p.* 386 (1876), (*Pegu*).

Assam to Burma and Siam.

1589. **Ninox scutulata affinis.** *The Andaman Brown Hawk-Owl.*

Ninox affinis *Tytler, Beavan, Ibis*, 1867, *p.* 285 (*Andamans*).

Andamans and Nicobars.

1590. **Ninox scutulata hirsuta.** *The Ceylon Brown Hawk-Owl.*

Ninox hirsuta *Temm., Pl. Col.*, 289 (1824), (*Ceylon*).

Ceylon.

1591. **Ninox obscura.** *Hume's Brown Hawk-Owl.*

Ninox obscura *Hume, S. F., i., p.* 77, (1873), (*Andamans*)

Andamans and Nicobars.

ORDER ACCIPITRES.†

Family PANDIONIDÆ.‡

1592. (1189) **Pandion haliaetus haliaetus.** *The Osprey.*

Falco haliaëtus *Linn., S.N.* 10*th ed., i., p.* 91 (1758), (*Sweden*).

Europe, Asia and Africa, winter to India.

Family GYPIDÆ.

1593. (1190) **Ægypius monachus.** *The Cinereous Vulture.*

‖ Vultur monachus *Linn., S.N.*, 12*th ed.* 1, *p.* 122 (1766) (*Arabia*) S. Europe, N. Africa, East to India and China.

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*This little Owl forms several geographical races which require working out.

†This order having just been completely worked by Mr. W. L. Sclater, he has very kindly allowed me to make use of his Ms. and other work for this Catalogue.

‡Very doubtfully separated from the true *Falconidæ* with which it is linked by the genus *Haliaëtus*.

‖*Vultur* applies to a quite different genus and *Ægypius* Savigny, 1809, is the next name applicable.

1594. (1191) **Torgos calvus.** *The Black or Pondicherry Vulture.*

Vultur calvus *Scop., Del. Flor. et. Faun. Insubr., ii., p.* 85 (1786), (*Pondicherry*).

India to Cochin China and Malay Pen.

1595 (1192) **Gyps fulvus fulvescens.** *The Indian Griffon Vulture.*

Gyps fulvescens *Hume, Ibis,* 1869, *p.* 356, (*Punjab*).

India, not extreme East or Ceylon. *?* Red Sea and Suakim.

1596. (1193) **Gyps himalayensis.** *The Himalayan Griffon.*

Hume, Rough Notes, i., p. 12 (1869), (*Simla*).

Himalayas, West from Bhutan to Turkestan and Tibet.

1597 (1194) **Gyps indicus indicus** *The Indian Long-billed Vulture.*

Vultur indicus *Scop., Del. Flor. et Faun. Insubr., ii., p.* 85 (1786), (*Pondicherry*).

Indian Pen., N. to Punjab and Rajputana.

1598 (1194) **Gyps indicus pallescens.** *The Pallid Vulture.*

Gyps pallescens *Hume, S.F., i., p.* 150 (1873), (*Ajmere*).

1599. (1195) **Gyps tenuirostris.** *The Himalayan Long-billed Vulture.*

Hume, S.F., vii., p. 326 (1878), (*Nepal*).

Bengal, Assam and foothills of Himalayas, Burma.

1600. (1196) **Pseudogyps bengalensis.** *The Indian White-backed Vulture.*

Vultur bengalensis *Gmel., S.N. i., p.* 245 (1788), (*Bengal*).

India and Burma to Malay Pen. and Annam.

1601. (1198) **Neophron percnopterus percnopterus.** *The Egyptian Vulture.*

Vultur percnopterus *Linn., S.N., i., p.* 87 (1758), (*Egypt*).

Africa, S. Europe East to N.W. India.

1602. (1197) **Neophron percnopterus ginginianus.** *The Smaller White Scavenger Vulture.*

Vultur ginginianus *Lath., In. Orn. i., p.* 7 (1790), (*Gingee S. India*).

India, S. to Ceylon and E. to Chota Nagpur, etc.

Family Falconidæ.

Sub-Family Gypaëtinæ.

1603. (1199) **Gypaëtus barbatus grandis.** *The Eastern Bearded Vulture.*

Gypaëtus grandis *Storr., Alpenreise vom Jahr.* 1781—4, *p.* 69 (*Switzerland*).

S. Europe, East to Central Asia, Himalayas and China.

Sub-Family Falconinæ.

1604. (1200) **Aquila chrysaetus daphanæ.** *Himalayan Golden Eagle.*

Aquila daphanæ *Hodg. in Gray's Zool. Misc., p.* 81 (1844), (*Nepal*).

Central Asia, Tianschan and Altai to Himalayas.

1605. (1202) **Aquila heliaca.** *The Imperial Eagle.*

Savigny, Descr. Egypte Says. Ois., p. 82 (1809), (*Upper Egypt*).

E. Europe and N. Africa to India.

1606. (1202) **Aquila nipalensis nipalensis.** *The Eastern Steppe-Eagle.*

Circaëtus nipalensis *Hodg., As. Res., xviii.,* (2), *p.* 13 (1833), (*Nepal*).

Mongolia and S.E. Siberia to the Altai, India and Burma.

1607. (1203) **Aquila rapax vindhiana.** *The Indian Tawny Eagle.*

Aquila vindhiana *Frank, P.Z.S.,* 1831, *p.* 114 (*Vindhya Hills.*)

India to Persian Baluchistan. Not Assam or Ceylon.

1608. (1205) **Aquila clanga.** *The Greater Spotted Eagle.*

Pall. Zoog. Rosso. Asiat. i., p. 351 (1827), (*Russia and Siberia*).

E. Europe to Amur, winter S. to S. Asia and N.E. Africa.

1609. (1206) **Aquila hastata.** *The Small Indian Spotted Eagle.*

Morphnus hastatus *Less., Voy. Ind. Belanger, p.* 217 (1834), (*Bengal*).

India and Burma, not Ceylon.

1610. (1207) **Hieraëtus fasciatus.** *Bonelli's Eagle.*

Aquila fasciata *Vieill., Mém. Soc. Linn. Paris, ii.,* (2), *p.* 152 (1822), (*Montpellier*).

S. Europe and N. Africa through India to China.

1611. (1208) **Hieraëtus pennatus.** *The Booted Eagle.*

Falco pennatus *Gmel., S.N., i.* (1), *p.* 272 (1788), (*Spain*).

S. Europe and N. Africa to India, Burma and Ceylon.

1612. (1209) **Lophotriorchis kieneri.** *The Rufous-bellied Hawk-Eagle.*

Astur kieneri *de Sparre, Mag. Zool.,* 1835, *Aves, pl.* 35 (*Himalayas*).

India and Burma and Malaya to Philippines ; Ceylon.

1613. (1210) **Ictinaëtus malayensis perniger.** *The Indian Black Eagle.*

Aquila, perniger *Hodg., J.A.S.B., v., p.* 227 (1836), (*Nepal*).

India, Ceylon, Burma, S. to Malay Pen.

1614. (1211) **Spizaëtus cirrhatus cirrhatus.** *The Indian Hawk-Eagle.*

Falco cirrhatus *Gmel., S.N., i., p.* 274 (1788), (*India*).

Indian Pen. N. to Rajputana and Central Provinces.

1615. (1212) **Spizaëtus cirrhatus limnaëtus.** *The Changeable Hawk-Eagle.*

Falco limnaëtus *Horsf., Trans. L.S., xiii., p.* 138 (*Java*).

Sub-Himalayan Tracts, Assam, Burma to Philippines.

1616. (1211) **Spizaëtus cirrhatus ceylanensis** *The Ceylon Hawk-Eagle.*

Falco ceylanensis *Gmel., S.N., i., p.* 275, (1788), (*Ceylon*).

Ceylon and Travancore.

1617. **Spizaëtus cirrhatus andamanensis.** *The Andaman Hawk-Eagle.*

Spizaëtus andamanensis *Tytler, P.A.S.B.,* 1865, *p.* 112 (*Port Blair*).

Andamans.

1618. (1213) **Spizaëtus nipalensis nipalensis.** *Hodgson's Hawk-Eagle.*

Nisaëtus nipalensis *Hodg., J.A.S.B., v., p.* 229 (1836), (*Nepal*).

Himalayas and sub-Himalayas, Hazara to Assam.

1619. (1214) **Spizaëtus nipalensis kelaarti**. *Legge's Hawk-Eagle.*

Spizaëtus kelaarti *Legge, Ibis.*, 1878, *p.* 202 (*Ceylon*).

Ceylon and Travancore.

1620. (1215) **Spizaëtus alboniger.** *Blyth's Hawk-Eagle.*

Nisaëtus alboniger *Blyth, J.A.S.B., xiv., p.* 173 (1845) (*Malacca*).

Tennasserim and Siam and Malay Pen. to Borneo.

1621. (1216) **Circaëtus gallicus.** *The Short-toed Eagle.*

Falco gallicus *Gmel., S.N., i.*, (1), *p.* 259 (1788), (*France*).

Central and S. Europe, N. Africa to India and China.

1622. (1217) **Spilornis cheela cheela.** *The Indian Crested Serpent-Eagle.*

Falco cheela *Lath., Ind. Orn., i., p.* 14 (1790), (*Lucknow*).

Himalayas, Kashmir to Sikkim, winter Southwards.

1623. (1217) **Spilornis cheela rutherfordi.** *The Hainan Serpent-Eagle.*

Spilornis rutherfordi *Swinh., Ibis*, 1870, *p.* 85 (*Central Hainan*).

Assam, Burma and Siam to Hainan.

1624. (1217) **Spilornis cheela albida.** *The Lesser Serpent-Eagle.*

Falco albidus *Temm., Pl. Col.*, 4, *pl. xix.* (1824), (*Pondicherry*).

Southern India.

1625. (1217) **Spilornis cheela spilogaster** *The Ceylon Serpent-Eagle*

Hæmatornis spilogaster *Blyth, J.A.S.B., xxi., p.* 351 (1852), (*Ceylon*).

Ceylon only.

1626. (1217) **Spilornis cheela davisoni.** *The Andaman Serpent-Eagle.*

Spilornis davisoni *Hume, S.F., i., p.* 307, (873), (*S. Andamans*).

Andaman and Nicobar Is.

1627. (1217) **Spilornis cheela ricketti.** *The Chinese Serpent-Eagle.*

Scl., Bull. B.O.C., xl., p. 37 (1919), (*Yamakan, Fokien*).

Mt. of S. China to Chindwin, U. Burma.

1628. (1217) **Spilornis cheela bassus.** *The Malayan Serpent Eagle.*

Falco bassus *Forster in Le Vaill. Nat. Af. Vog., p.* 55 (1798).

Malay Pen. S. Tennasserim to Sumatra.

1629. (1218) **Spilornis minimus.** *The Nicobar Serpent-Eagle.*

Hume, S.F., i., p. 464 (1873), (*Camorta, Nicobars*).

Northern group of Nicobars.

1630. (1219) **Spilornis elgini.** *The Andaman Serpent-Eagle.*

Tytler, J.A.S.B., xxxii., p. 87 (1863), (*S. Andaman Is.*)

Andaman Is.

1631. (1219) **Spilornis klossi.** *Kloss' Serpent-Eagle.*

Richmond, Pro. U.S. Nat. Mus., xxv., p. 304 (1902) (*Great Nicobars*).

Great Nicobars.

1632. (1220) **Butastur teesa.** *The White-eyed Buzzard.*

Cirius teesa *Frankl., P.Z.S.,* 1831-2, *p.* 115 (*Ganges, Nerbudda*).

All India, E. to Burma.

1633 (1221) **Butastur liviventer.** *The Rufous-winged Buzzard-Eagle.*

Falco liviventer *Temm., Pl. Col.* 74, *pl.* 438 (1877), (*Java*).

Burma, Siam and Celebes and ? Java and Timor.

1634. (1222) **Butastur indicus.** *The Grey-faced Buzzard-Eagle.*

Falco indicus *Gmel., S.N., i., p.* 264 (1788), (*Java*).

Breeding N.E. Asia, winter South. Straggler N. Burma.

1635. (1223) **Cuncuma leucorypha.** *Pallas' Fishing-Eagle.*

Aquila leucorypha *Pall., Reise. Russ. Reichs, i., p.* 454 (1771), (*Lower Ural R.*).

S. Russia to Transbaikalia and N. India and Burma.

1636. (1224) **Cuncuma leucogaster.** *The White-bellied Sea-Eagle.*

Falco leucogaster *Gmel., S.N., i., p.* 257 (1788), (*New South Wales*).

Coasts of India, Ceylon, Burma and S. China to Australia.

1637. (1225) **Haliaetus albicilla.** *The White-tailed Sea-Eagle.*

Falco albicilla *Linn., S.N., i., p.* 89 (1758), (*Sweden*).

Breeding N. Europe and Asia, winter to India, etc.

1638. (1226) **Polioaëtus ichthyaëtus.** *The Large Grey-headed Fishing Eagle.*

Falco ichthyaëtus *Horsf., Trans. L.S., xiii., p.* 136 (1821). (*Java.*)

India, Ceylon, Burma to Philippines.

1639. (1227) **Polioaëtus humilis humilis.** *The Malayan Fishing Eagle.*

Falco humilis *Müll. & Schleg., Verh. Nat. Gesch. Aves., p.* 47 (1840), (*Sumatra*).

Sumatra, etc., Malay Pen., to South Tennasserim.

1640. (1227) **Polioaëtus humilis plumbeus.** *The Himalayan Fishing-Eagle.*

Polioaëtus plumbeus *Jerdon, Ibis,* 1871, *p.* 336, (*N. W. Himalayas*).

Sub-Himalayas, Kashmir to Assam and Upper Burma.

1641. (1228) **Haliastur indus indus.** *The Brahminy Kite.*

Falco indus *Bodd., Tabl. Enl.,* 1783, *p.* 25 (*Pondicherry*).

India, Ceylon, Burma, Malay Pen., Indo China and China.

1642. {(1229) (1231)} **Milvus migrans govinda.** *The Common Pariah Kite.*

Milvus govinda *Sykes, P.Z.S.,* 1832, *p.* 89 (*Deccan*).

India, Ceylon, Burma, Malay Pen., Siam to Hainan.

1643. (1230) **Milvus migrans lineatus.** *The Black-eared Kite.*

Haliaëtus lineatus *Gray in Hard., Ill. Ind. Zool., i., p. i.* (1832), (*China*).

Central Asia S. to Himalayas, E. to Japan, winter widely spread.

1644. (1232) **Elanus cœruleus cœruleus.** *The Black-winged Kite.*

Falco cœruleus *Desfon., Hist. Acad. Roy., Paris.* 1787-9, *p.* 503 (*Algiers*).

Africa from Algiers, E. to India, Ceylon, Burma, etc

1645. (1233) **Circus macrourus.** *The Pale Harrier.*

Accipiter macrourus *S. G., Gmel., N. Comm., Acad. Petro., xv., p.* 489 (1771), (*Veronitz, Volga*).

Roumania to Altai ; winter to India, Ceylon, Burma and Africa.

1646. (1334) **Circus pygargus.** *Montagu's Harrier.*

Falco pygargus *Linn., S. N., p.* 89 (1758), (*England*).
Europe and N. Asia, winter South.

1647. (1335) **Circus cyaneus.** *The Hen Harrier.*

Falco cyaneus *Linn., S.N., i., p.* 126 (1766), (*Near London*).
Europe and N. Asia, winter South.

1648. (1236) **Circus melanoleucus.** *The Pied Harrier.*

Falco melanoleucus *Forst. Ind. Zool., p.* 12 (1781), (*Ceylon*)
N. E. Asia, South in winter.

1649. (1237) **Circus æruginosus æruginosus.** *The Marsh Harrier.*

Falco æruginosus *Linn., S.N., p.* 91, (1858), (*Sweden*).
Europe and N. Asia, winter southwards.

1650. (1238) **Circus spilonotus.** *The Eastern Marsh Harrier*

Kaup. in Jard., Con. Orn., p. 59 (1850), (*Asia, Philippines*)
Transbaikalia and Tibet, winter southwards.

1651. (1239) **Buteo ferox.** *The Long-legged Buzzard.*

Accipiter ferox, *S.G., Gmel. Nov. Comm. Acad., Petro., xv. p.* 442 (1771), (*Astrakan*).
S. and Central Russia and Central Asia to Himalayas.

1652. (1240) **Buteo hemilasius.** *The Upland Buzzard.*

Temm. & Schleg. in Sieb. Faun. Jap., p. 16 (1845) (*Japan*).
Eastern Asia, S. to Himalayas and S. China.

1653. (1241) **Buteo buteo rufiventer.** *The Desert Buzzard.*

Buteo rufiventer *Jerd., Madr. Jour. L.S., xiii., p.* 165 (1844), (*Nilghiris*).
Breeding S.E. Russia, Asia Minor and Persia, S.E. in winter.

1654. (1241) **Buteo buteo japonicus.** *The Japanese Deser Buzzard.*

Falco buteo japonicus *Temm. & Sch. in Sieb. Faun. Jap., p.* 16 (1845), (*Japan*).
Breeding in Turkestan to Higher Himalayas.

1655. (1243) **Astur gentilis schvedowi.** *The Eastern Goshawk.*

Astur palumbarius schvedowi Menzb., Orn. Geogr. Eur., Russ. in Mem. s.c., Un. Imp. Mosc., p. 439 (1882), (*Transbaikalia*).

Northern Asia and S. to N. India, Burma and Central China.

1656. (1244) **Astur badius badius.** *The Ceylon Shikra.*

Falco badius *Gmel., S.N., i., p.* 280 (1788), (*Ceylon*).

Ceylon and Travancore.

1657. (1244) **Astur badius dussumieri.** *The Shikra.*

Falco dussumieri *Temm., Pl. Col. livr.* 52, *pl.* 308 (1824), (*Bengal*).

N. India from Kashmir to North Assam.

1658. (1244) **Astur badius poliopsis.** *Hume's Shikra.*

Micronisus poliopsis *Hume, S.F., ii., p.* 325 (1874), (*Thayetmyo*).

S. Assam, Burma, S. to Trang and E. to Hainan.

1659. (1244) **Astur badius cenchroides.** *Severtzov's Shikra.*

Astur cenchroides *Severtz., Turkes. Jevit., p.* 63 (1873), (*Turkestan*).

Turkestan to Baluchistan, Sind and Punjab.

1660. **Astur butleri.** *Butler's Shikra or Goshawk.*

Gurney, Bull. B.O.C., vii., p. xxvii. (1898), (*Car Nicobar*)

Nicobar Islands.

1661. **Astur obsoletus.** *Richmond's Shikra or Goshawk.*

Richmond, Pro., U. S. Nat. Mus., xxv., p. 306 (1902) (*Katchal*).

Nicobar Islands.

1662. (1245) **Astur soloensis.** *Horsfield's Goshwak.*

Falco soloensis *Horsf., Trans. L.S., xiii., p.* 137 (1821), (*Java*).

Breeding China, S. in winter to Assam, Burma, etc.

1663. (1246) **Astur trivirgatus trivirgatus.** *The Crested Goshawk.*

Falco trivirgatus *Temm., Pl. Col., pl.* 303, (1824), (*Sumatra*) South India, May. Pen and Java, etc.

1664. (1246) **Astur trivirgatus rufitinctus.** *The Great Crested Goshawk.*

Spizaëtus rufitinctus *McClell., P.Z.S.*, 1839 *p.* 153 (*Assam*).

N. India, Burma to Formosa and Hainan.

1665. (1247) **Accipiter nisus nisosimilis.** *The Asiatic Sparrow-Hawk.*

Falco nisosimilis *Tick., J.A.S.B., ii., p.* 571 (1833), (*Bengal, Borabhum*).

Breeding Turkestan to Japan. Winter India, etc.

1666. (1247) **Accipiter nisus melanoschistus.** *The Indian Sparrow-Hawk.*

Accipiter melanoschista *Hume, Ibis*, 1869, *p.* 356 (*Kotegarh*).

Himalayas, Kashmir to Assam and N. Burma, etc.

1667. **Accipiter gularis.** *The Japanese Sparrow-Hawk.*

Astur gularis *Temm. & Schleg. in Sieb., Faun., Jap., p.* 5 (1845), (*Japan*).

Breeding N. E. Asia. Rare straggler to Burma in Winter.

1668. (1248) **Accipiter virgatus besra.** *The Besra Sparrow-Hawk.*

Accipiter besra *Jerd., Madr., Jour. L.S., x., p.* 84 (1839) (*S. India*).

S. India and Ceylon.

1669. **Accipiter virgatus affinis.** *The Larger Besra Sparrow-Hawk.*

Accipiter affinis *J. E. Gray, Zool. Misc., p.* 81 (1844) (*Nepal*).

Himalayas from Pindi to Assam, Burma, China, etc.

1670. (1249) **Pernis cristatus ruficollis.** *The Indian Crested Honey-Buzzard.*

Pernis ruficollis *Less., Traité d'Orn., p.* 76 (1831),(*Bengal*), India, Ceylon, Burma, Malay Pen. to Siam and S. China.

1671. (1250) **Machærhampus alcinus.** *The Slender-billed Pern.*

Westermann, Bigd. t. d. Dierk, i. (2), *p.* 29 (1851), (*Malacca*).

S. Tennasserim, Malay Pen. to New Guinea.

1672. (1251) **Lophastur leuphotes leuphotes.** *The Black-crested Baza.*

Falco leuphotes *Dumont, Dict. Sci. Nat., xvii., p.* 217 (1820), (*Pondicherry*).

Nepal Terai, Bengal, Travancore and Ceylon.

1673. (1251) **Lophastur leuphotes burmana.** *The Burmese Black-crested Baza.*

W. L. Sclater, Bull. B.O.C., xli., p. 31 (1920), (*Malucom*),

Assam, Burma, Siam, Indo China to Malay Pen.

1674. (1252) **Aviceda jerdoni jerdoni.** *Blyth's Baza.*

Lophastur jerdoni *Blyth., J.A.S.B., xi., p.* 464 (1842), (*Malacca*).

Sikkim, Assam, Burmese Hills to Malay Pen. and Sumatra.

1675. (1253) **Aviceda jerdoni ceylonensis.** *Legge's Baza.*

Baza ceylonensis *Legge, S. F., iv., p.* 247 (1876), (*Kandy Ceylon*).

Ceylon, Travancore, Wynaad.

1676. (1254) **Falco peregrinus calidus.** *The Siberian Peregrine Falcon.*

Falco calidus *Lath., Ind. Orn., i., p.* 41 (1790). (*India*).

Breeding N. and Central Asia. Winter S. to India, Burma, Ceylon, etc.

1677. (1255) **Falco peregrinus peregrinator.** *The Indian Peregrine Falcon.*

Falco peregrinator *Sund., Phys. Sall. Tid., i., p.* 177 (1837), (*Indian Ocean*).

India, Ceylon and Burma in hill country.

1678. (1256) **Falco peregrinus babylonicus.** *The Red-capped Falcon.*

Falco babylonicus *Gurney, Ibis,* 1861, *p.* 218 (*Oudh*).

Breeding Mesopotamia to Turkestan and Baluchistan.

1679. (1257) **Falco jugger.** *The Laggar Falcon.*

Gray in Hard., Ill. Ind. Zool., ii., pl. 26 (1833-4), (*India*).

India and N. Burma.

1680. (1258) **Falco cherrug cherrug.** *The Saker Falcon or Cherrug.*

Falco cherrug *Gray, op. cit., pl.* 25 (1833-4), (*India*).

S. E. Europe and Central Asia, winter S. to India, etc.

1681. (1259) **Falco cherrug milvipes.** *Hodgson's Saker or Shanghar Saker.*

Falco milvipes *Hodg., in Gray's Zool. Misc., p.* 81 (1844) (*Nepal*).

Central Asia, winter to India, etc.

1682. (1260) **Falco subbuteo subbuteo.** *The Hobby.*

Falco subbuteo *Linn., S.N., p.* 89 (1758), (*Sweden*).

Europe and N. Asia, straggler to India in winter.

1683. (1260) **Falco subbuteo streichi.** *The Chinese Hobby.*

Hartert & Neum., Jour. f. Orn., 1907, *p.* 572 (*Swatow, S. China*).

China, visitor to Burma.

1684. (1261) **Falco severus severus.** *The Burmese Hobby.*

Falco severus *Horsf., Trans. L.S., xiii., p.* 135 (1822), (*Java*).

Assam, Burma and Indo China to Philippines.

1685. (1261) **Falco severus indicus.** *The Indian Hobby.*

A. B. Meyer & Wiglls., B. of Celebes, i., p. 84 (1897)*i* (*Calcutta*).

Himalayas to Travancore and Ceylon.

1686. (1262) **Falco vespertinus amurensis.** *The Eastern Red-footed Falcon.*

Falco vespertinus var. amurensis *Badde, Reis. Ost. Sib., ii., p.* 110 (1863), (*Blagowestschensk, Amur, Siberia*).

Central and E. Siberia, S. in winter to Africa, India, China, etc.

1687. (1263) **Falco columbarius insignis.** *The Asiatic Merlin.*

Æsalon regulus insignis *Clark, P.U.S. Nat. Mus., xxxi., p.* 470 (1907), (*Corea*).

Northern Asia, S. in winter.

1688. (1264) **Falco chiquera chiquera.** *The Red-headed Merlin.*

Falco chiquera *Daudin, Traité, ii., p.* 121 (1800), (*Bengal*).

India, West to Quetta, East to Assam.

1689. (1265) **Falco tinnunculus tinnunculus.** *The Kestrel.*

Falco tinnunculus *Linn., S.N., p.* 90 (1758), (*Sweden*).

In winter to India, Burma and Ceylon.

1690. (1265) **Falco tinnunculus interstinctus.** *The Indian Kestrel.*

Falco interstinctus *McClell., P. Z. S.*, 1839, *p.* 154 (*Assam*).

Breeding Mts. of India and Burma to W. China.

1691. (1266) **Falco naumanni pekinensis.** *The Chinese Lesser Kestrel.*

Falco cenchris var. pekinensis *Swinh., P.Z.S.*, 1870, *p.* 442 (*Pekin*).

N. China, S. in winter to India, Burma, etc.

1692. (1267) **Microhierax cœrulescens cœrulescens.** *The Red-legged Falconet.*

Falco cœrulescens *Linn., S.N., p.* 88 (1758), (*Bengal*).

Sub-Himalayas, Kumaon to Assam.

1693. (1267) **Microhierax cœrulescens burmanicus.** *The White-breasted Falconet.*

Swann, Synop., Accip. p. 116 (1920), (*Thayetmyo*).

Burma, Siam, Cambodia, Annam.

1694. (1268) **Microhierax melanoleucus melanoleucus.** *White-legged Falconet.*

Ierax melanoleucus *Blyth, J.A.S.B, xii., p.* 179 (1843) (*Assam*).

Assam, to Indo China.

1695. (1269) **Microhierax fringillaris.** *The Black-legged Falconet.*

Falco fringillaris *Drap., Dict. Class. d'Hist. Nat., vi., p.* 412 (1824), (*Malacca*).

Tennasserim, S. to Borneo.

1696. (1270) **Poliohierax insignis.** *Fielden's Falcon.*

Poliohierax insignis *Walden, P.Z.S.*, 1871, *p.* 627 (1872) (*Toungo*).

Burma.

HIMALAYAN IBEX (*Capra sibirica*)
Shot in Baltistan by Maj. C. H. Stockley.

HIMALAYAN TAHR (*Hemitragus jemlaicus*)
Shot in Kishtwar by Maj. C. H. Stockley.

(*Photos contributed by Maj. C. H. Stockley.*)

GAME ANIMALS OF KASHMIR AND ADJACENT HILL PROVINCES.

BY
COL. A. E. WARD.

Part III.

(*Continued from page 344 of this volume.*)

(*With 1 plate and 4 text figures.*)

GOATS.

No. 348. THE HIMALAYAN IBEX. (*Capra sibirica.*)

Himalayan Ibex (*Capra sibirica*)

(From the Society's collection. 45″).

The "*Kheyl*" of Kashmiris.

The spring is the season for Ibex shooting, when they come down to the green grass from their winter quarters during the morning and evening hours. They may even stay in the valleys during the day, provided the country is undisturbed, and there are no snow leopards on the prowl. In addition cliffs must be adjacent to the grazing grounds. An ibex seems to be only at ease when lying amongst the precipices from whence he can look down and watch the low ground whilst a "nanny" does sentry duty in the vicinity.

In the spring the flocks of Ibex are fairly large, and all sizes are banded together, but in the summer the larger bucks wander off to the heights, leaving the females and kids on the lower ground.

In the summer, say after June, shooting is difficult, many a stalk is spoilt by the mist which drives up from below, and lands the gunner in difficulties.

Ibex come to grief in avalanches, for even in the winter they generally keep up at great elevations. In the Indus valley, Baltistan Ibex come low down in winter, for the cliffs on that river are at a low altitude. There is no other suitable ground at hand except perhaps in Dachin and the lower Wardwan, hence they have to remain high up.

How do Ibex exist on the heights during the winter? they must be endowed with the power of living on very little food. Places where Ibex have wintered can be found: one was between two almost parallel lines of cliffs on the

southern side of a hill ; from the foot of one lot of cliffs a steep slope ran to the top of the next line of precipices. The upper cliffs overhung the slope. Many traces remained, and hair, skin and the horns of females were lying on the ground. Very possibly the Ibex were starved to death, and bears or vultures got to work and broke up the dead goats.

Another winter quarter was much trampled ; it was practically a large cave with a wide opening to the south. Hair was plentiful, but no skin or bones, so probably all went well, but very short rations must have been the rule.

Measurement of Ibex Horns.

OMITTING THOSE FROM THE PAMIR.

Index No.	Measurements			Name of Sportsman	Date	Locality, etc.
	Length	Girth	Tip to Tip			
1	55	11½	35½	Major B. E. M. Gurdon.. ..	1905	Gilgit.
2	53	10¼	34¼	Major B. E. M. Gurdon.. ..	1904	Gilgit.
3	51⅞	..	..	Major E. H. S. Thomas ..	1917	Gilgit.
4	51	10¼	29	F. W. Hodgkins	1908	Gilgit.
5	50½	10¼	35	Major Anderson..	1908	Baltistan
6	50	11	26	Capt. Nugent Head	1920	Baltistan.
7	50	10¼	23	Capt. Bruce	1908	Baltistan.
8	50	10¼	..	J. B. Somerville..	1909	Baltistan (1 tip broken).
9	50	10⅛	..	Capt. E. W. Palmer	1909	Baltistan.
10	50	10	22½	F. W. Hodgkins	1908	Gilgit.
11	50	10	..	A. E. Ward	1887	Zogila (Found dead).
12	49½	10	27	F. W. Hodgkins	1909	Gilgit.
13	49	11	..	Col. Cuppage	..	Lidarwat, Kashmir.
14	49	11	..	Picked up by a shikari ..	1885	Lidarwat.
15	49	11	30	W. Wainright	..	Gilgit.
16	49	10¼	33½	H. H. Cripps	1909	Baltistan.
17	49	10¼	20	G. S. Cooper	1907	Ladak.
18	49	10	19½	Capt. L. Murray	1907	Baltistan (Brader).

Index No.	Measurements			Name of Sportsman	Date.	Locality, etc.
	Length	Girth	Tip to Tip			
19	49	9¾	36	Capt. L. Murray	1907	Baltistan.
20	48½	11¼	34	A. E. Ward	1881	Wardwan.
21	48½	..	..	Capt. R. A. Lowther	1921	Baltistan
22	48½	10½	31	R. H. R. Brocklebank	1905	Ladak.
23	48½	..	..	A. C. Charlington	1903	Baltistan
24	48	11¼	16	C. C. McGregor	1913	Baltistan.
25	48	11	23	K. A. Jenkins	1911	Astor.
26	48	10½	25½	Capt. Purchas	1921	Kishtwar.
27	48	..	..	C. M. Denkin	1911	Baltistan.
28	48	..	31	R. V. C. Bodley	1913	Baltistan (Brader.)
29	48	10	32½	V. F. Byrnes	1919	Baltistan.
30	48	..	..	Capt. Nugent Head	1920	Baltistan
31	47¾	10½	34	R. H. R. Brocklebank	1905	Ladak.
32	47½	9¾	..	Capt. J. F. Barrington ..	1912	1 tip broken
33	47½	9½	14¼	J. G. Apcar	1906	Baltistan.
34	47	..	..	Capt. Campbell	1900	Gilgit.
35	47	..	..	Capt. McConaghey	1901	Gilgit.
36	47	10¾	35	G. N. Deas	1920	Baltistan
37	47	10½	..	Capt. S. B. Patterson	1905	Ladak
38	47	10¼	35	Lady Constance Stewart Richardson.	..	Baltistan.
39	47	10	20	G. H. McGaw	1907	Baltistan.
40	47	..	..	Capt. Miller Hallett	1918	Gilgit.
41	47	..	..	Capt. Williamson	1919	Baltistan.

Index No.	Measurements			Name of Sportsman	Date	Locality, etc.
	Length	Girth	Tip to Tip			
42	47	..	..	Major MacCullock	1920	Baltistan.
43	47	9½	24½	Capt. A. G. Eden	1913	Baltistan.
44	46¾	11	..	Capt. Jeffereys	1905	Baltistan.
45	46¾	10¼	..	G. Des Vieux	1910	Hushai.
46	46¾	9¾	25¼	G. P. Radclyffe	..	Baltistan.
47	46½	10½	23½	Capt. Bogle	1904	Gilgit.
48	46½	..	..	H. C. Strong	1908	....
49	46½	..	..	Capt. Bickford	1917	Cherkila
50	46	11	..	A. E. Ward	1887	Astor.
51	46	11	..	Capt. S. B. Patterson	1905	Baltistan.
52	46	10½	17¾	R. Walpole	..	Baltistan.
53	46	10½	26½	Major J. F. P. Langdon ..	1907	Baltistan.
54	46	10½	31	V. A. R. Stokes	1911	Baltistan.
55	46	9½	26½	Warton	1904	Baltistan.
56	46	9½	16¾	R. S. B. Aldsey	1904	Baltistan.
57	46	..	..	Major E. H. S. James	1917	Gilgit.
58	46	..	..	Capt. S. Stuart Mellow ..	1920	Baltistan.
59	46	..	..	Major MacCullock	1920	Baltistan.
60	46	..	..	L. G. McKinsuey	1921	Wardwan.

Between 45″ and 46″ there is a list of 30 heads, of these one has a girth of 11½″ shot by Mr. Lucas Tooth in Astor. Two girthed 11″ one shot by Mrs. Hext in Baltistan, the other by A. E. Ward in Dumoot. Since peace was concluded twelve heads measuring between 45″ and 48½″ in length have been recorded. Ibex shooting within the watershed of the Jhelum is now prohibited.

The records of old date prove that very big horns were got in Kashmir proper. Look at the measurements of Nos. 13 and 14. Not long ago a fine herd was seen in another branch of the Liddar Valley. It is an open question whether the prohibition regarding shooting will give good results. The best guardian of a shooting block is the license holder; he can of course shoot up to his limit, but what is that compared with the number that the goat-herds can slay, and besides this the sportsman would naturally try to kill leopards and bears. A Botanist or a Field Naturalist may now and again visit the heights of Kashmir, but on their own job, not to hunt game.

Tian Shan Ibex.

Index No.	Measurements: Length	Measurements: Girth	Measurements: Tip to Tip	Name of Sportsman	Date	Locality, etc.
1	59½	13½	52½	P. F. Hadow, Esq. ..	1907	Tian Shan.
2	56¾	10¼	23¾	P. F. Hadow, Esq. ..	,,	,,
3	56	..	..	Picked up in the Tagdumbash and measured by two travellers.	,,	
4	53⅛	10¾	34	P. F. Hadow, Esq. ..	,,	,,
5	53	11½	28¾	P. F. Hadow, Esq. ..	,,	,,

To hark back to the hill side and records of sport.

A flock of Ibex were seen on the right bank of a snow-fed stream which was for the time being a torrent. The flock was too far off to tell whether any bucks were about, hence the necessity to climb and get nearer. The ascent had to be made up a ravine which joined the main river higher up; the ridge was then crossed and the ground searched. Nothing was to be seen. A move was then made to the "snowed stream" where behind some rocks breakfast and a rest were taken.

Opposite and across the stream were precipitous rocks along which narrow uneven ledges passed along the face of the cliff.

Reading the newspapers and writing up the journal took off attention, but the local shikari was on the alert, and crawling up he whispered "Kheyl"! On the narrow ledge were two bucks, which had come from opposite directions and were a close at hand. As they approached one another both stood still; one or the other was bound to turn, for if they fought at any rate one would fall into the torrent below and be swept away. After a time the bigger of the two raised himself on his hind legs for a second and then stood still; this was too much for the other, he turned, keeping his horns outwards very cleverly and fled. The big one then slowly advanced, affording a very tempting shot, but he would have fallen down the cliff and would never have been retrieved in the torrent.

It does not take long to write up the story, but on the vast hill side, it is a different matter. Descending was a long job. The ridges above the rocks had to be negotiated until the forest was reached, and a couple of small trees shoved across a narrow gorge. On the far side of the stream the modest camp was pitched just before dark. At dawn a man was sent up and told to try and find the flock, or the two bucks; there was almost certain to be a flock for it was still spring time. Obedient to orders the man returned directly he had sighted the Ibex, but the wind was wrong and there was no chance of an approach from below. Very early on the next day a move upwards was made, the ground above the cliffs was easy going and the Ibex were soon located. On a slope above the rocks, two were playing; rising on their hind legs they made a great show of

fighting but evidently they were not in earnest. Here and there the rest of the flock were feeding. Suddenly the " nanny " on guard whistled, at once the two stopped playing and with them all turned upwards. Amongst them probably were the two which met on the narrow ledge. There was no time to delay and what was evidently a grand beast was fired at. It was a nasty one-quarter-on shot and he staggered as the bullet struck him, and moved on, until the left barrel brought him to a recumbent position almost behind a big stone. When he was reached he could not get up.

What a difficult shot it is when the quarry is feeding under a cliff and the gunner is trying to get into position by looking over from above! Under these circumstances, it affords one very little comfort for the shikari to say he will hold on to one and stop a fall, somehow the rifle will not get into position and feels as if it must be dropped. Now and again this predicament is sure to come. For days three good bucks had been watched. On one occasion the mist came up, on another they fairly won the game by moving steadily away, they had not got the wind nor were they frightened, but went on and on over very difficult ground. At last it was settled to go to a cave high up in the hills, so food and bedding with a change of clothes were taken, and as luck turned out 4 or 5 men including the old gun bearer and local shikari.

The cave floor was spread with creeping juniper boughs, and a small bundle of pitch pine splinters was taken in order to light the fire. After a long search the bucks were found under a cliff which stood erect bordering a small ravine. They were not more than 100 feet below and it was from the top of this cliff that the attempt was made. The bullet struck the ground some distance beyond the Ibex. They rushed up the ravine and turned to the left giving fairly easy shots. Two ·500 bore rifles had been taken out and four barrels were in all fired.

Fairly big bore rifles do not lend themselves to much fusilading, and there were consequently many wounded animals.

One Ibex fell, a second was not fired at, and the third could not be seen for some seconds, then he was spotted slowly labouring upwards, very hard hit and on his last legs. He stopped and stood broadside on, and would have given an easy shot for a high velocity small bore, but was out of range for the ·500.

Watching through the telescope, the buck was seen to double his legs under him, slowly sink on his stomach and fall on his side. On reaching him the mark of the bullet showed in the middle of the ribs.

The summer was advancing, and unsettled weather was coming from below. The local shikari fussed and wanted to cut off the Ibex head and bolt downwards, but the lust for meat caused the other men to skin and cut up the carcases. Before this operation was over, snow began to fall and a hurried return was made to the cave, where luckily a few half burnt sticks remained from the morning's fire. Everything was thrown into the cave, and everyone collected juniper boughs until the snow was thick on the ground. For two days snow fell heavily, then the sun shone, and the soft snow began to slide down the slopes making a move impossible until the fourth day.

Dry chupatties and a little revolting Ibex meat is poor food even when washed down with brandy and smoky water!

One head was a very fine one and taped over 48 inches in length; a typical Wardwan head of the best. The other horns were not diminutive but were too small to bother much about and as there was much to be carried they were left in the cave with the intention of sending for them later on. This however never came off. Twice has a cave been useful and practically afforded preservation. When there is no leakage from melting snow, it is all right being dry, although a bit dreary, but when there is no dry place except on a bundle of juniper boughs it is trying.

Probably it is even harder to kill game with the sun facing the gun than it is to do so when shooting directly downwards. A start is generally made in the early morning when the sun is behind the hills, but often a great deal of time is lost whilst getting over bad ground, and just as the last few yards have to be passed the sun tops the hill, and the difficulty of looking along the barrel and taking a fine sight is so great that a shot at 50 yards is often clean missed. What with the wind changing and regard having to be taken as to the sun, mist driving up, and bad ground, no one can expect successful sport after Ibex without much patience and endurance, and it may be added that good food is a necessity. If suitable ground for an approach is impossible, and the Ibex are in a ravine, they can be brought up to the gun, by sending a couple of intelligent men to give them the wind. On two occasions this method came off well, but often it fails.

Whilst seated behind a rock just under the head of the ravine, in fact almost on the crest, a large herd streamed passed, but there were no males worth shooting. In another drive, if it could be called so, the Ibex came in a flock and behind them was a Thar. This was luck, for the coolies were clamouring for meat, and were short of rice. The Thar supplied this want, and also saved the pricking of conscience, for enough Ibex had been killed during the trip, and somehow the proceedings did not seem to be fair.

Long ago when there were no game laws the Governor of Leh gave an entertainment in the Basgo Nullah (on the road to Ladak) which in those days was full of Ibex.

The camp was pitched close to the Ladak road, where a crowd of Ladakis had assembled with their dogs. Some very fine Baltistan dogs, not unlike the big lurchers, were also in camp, but they were not vicious, while on the contrary no stranger dare go near the Ladaki hounds.

The Governor explained that the Basgo ravine would be surrounded and the dogs would be let loose, the Ibex would go into the cliffs and probably stand. From the point of view of a strange sight the drive was a success on the whole, but as a sporting undertaking it was a mean advantage. Many of the Ibex broke through, but several were shot as they took refuge in the rocks, where the Baltis seemed to be almost as much at home on bad ground as the goats!

One buck stood looking over a cliff with his head over the edge below, but at some distance away dogs were barking furiously. Walking below and looking upwards it was a pretty sight, but to shoot at the poor beast was not to be thought of. Eventually that Ibex managed to get away.

Nearly all those shot were females or very small males.

To see much of the drive was impossible. Basgo is a big nullah, much shooting was to be heard, and now and again a few Ibex and several dogs passed.

Time makes changes. When the Game Preservation Department was started Basgo became a sanctuary, and efforts were made to stop the Ibex drives for if these come off in the snow, the results were fatal to the game. On the next day another drive was undertaken elsewhere, but luckily the game got through the stops, and only left two or three behind which were probably slain.

The impression left was that Game Preservation was urgent, sporting weapons were being steadily improved, and soon accurate rifles would supersede the smooth bore, and these combined with the aid of dogs and snow would exterminate the hill animals.

No. 349. Markhor (*Capra falconeri.*)

The *Markhor* of Kashmir.

The two varieties of this grand goat which exist within the limits of the territory dealt with in these articles are familiarly known as

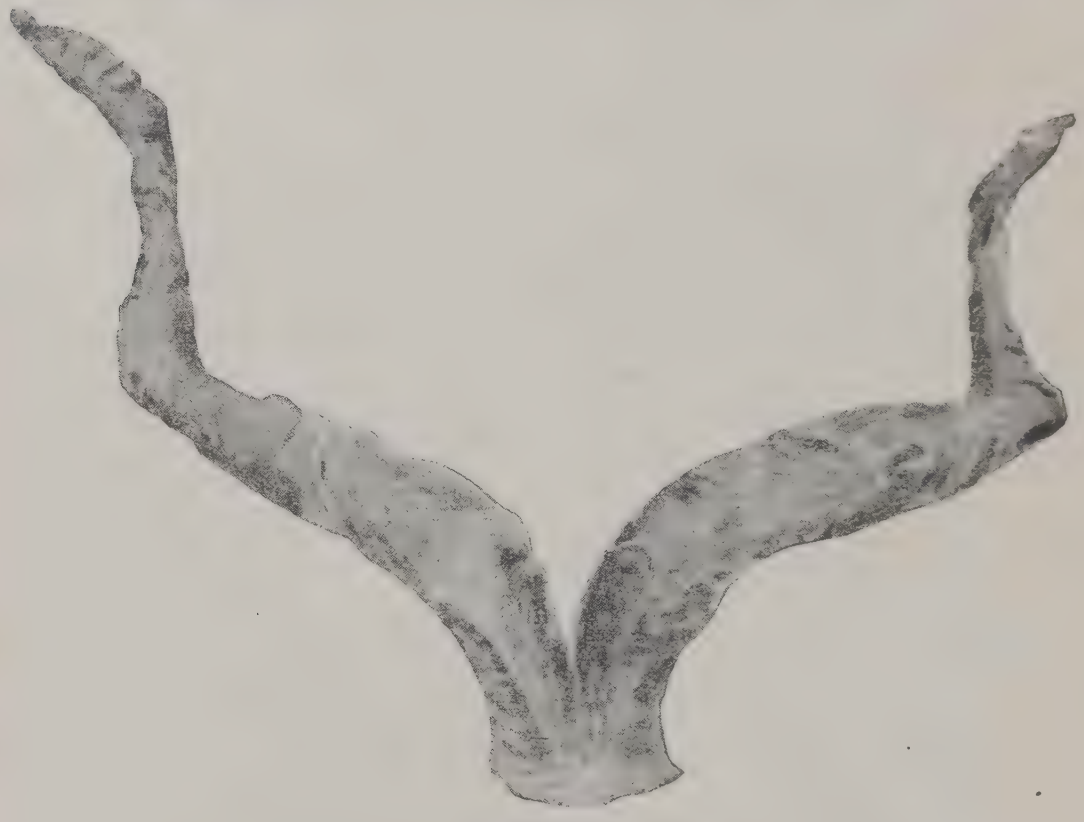
1. The Astor (*Capra falconeri falconeri*) with a bold single twist which gives a massive appearance.

2. The Pir Panjal or Kajnag (*Capra falconeri cashmiriensis*) with 2 to 2½ spirals.

Some of the Kajnag heads vary and almost approach the other variety in the curves.

There is a third or Trans-Indus variety (*Capra falconeri jerdoni*) with 4 or more twists, but this is not an appropriate name, for the "Astor" is also a Trans-Indus animal; the term Sulieman Markhor is a better one. There is also a Cabul Markhor (*Capra falconeri megaceros*). The Pir Panjal and Astor horns are generally measured round the curves, the Suleiman which have many twists are taped straight.

The list of horns is not a long one, for very few big heads are secured, but doubtless several between 50 to 52 inches have not been recorded.



A pair of Astor Markhor Horns.
Length 53″ (much weatner worn and rather uneven).

Measurements of Astor Markhor horns from Baltistan (Astor) and Gilgit.

Index No.	Length	Girth	Tip to Tip	Name of Sportsman	Date	Locality, &c.
1	61¼	12	47	Capt. Barstow	1907	Gupi's, Gilgit.
2	57	11¼	37	Capt. Molesworth	1916	Gilgit.
3	56¼	10¾	37	W. P. Appleford	1910	,,
4	55	..	..	Capt. Haughton	1911	,,
5	55¼	11	38¾	Capt. Selous	1906	Astor.
6	52	11	40	A. E. Ward	1887	Gilgit.

Above Dumoot in the Gilgit District amongst a pile of old horns, a much worn single one was found, this was carefully measured as 61 inches, and was

brought to Boonji, where many people must have seen it. Another single horn of 63 inches has been recorded.

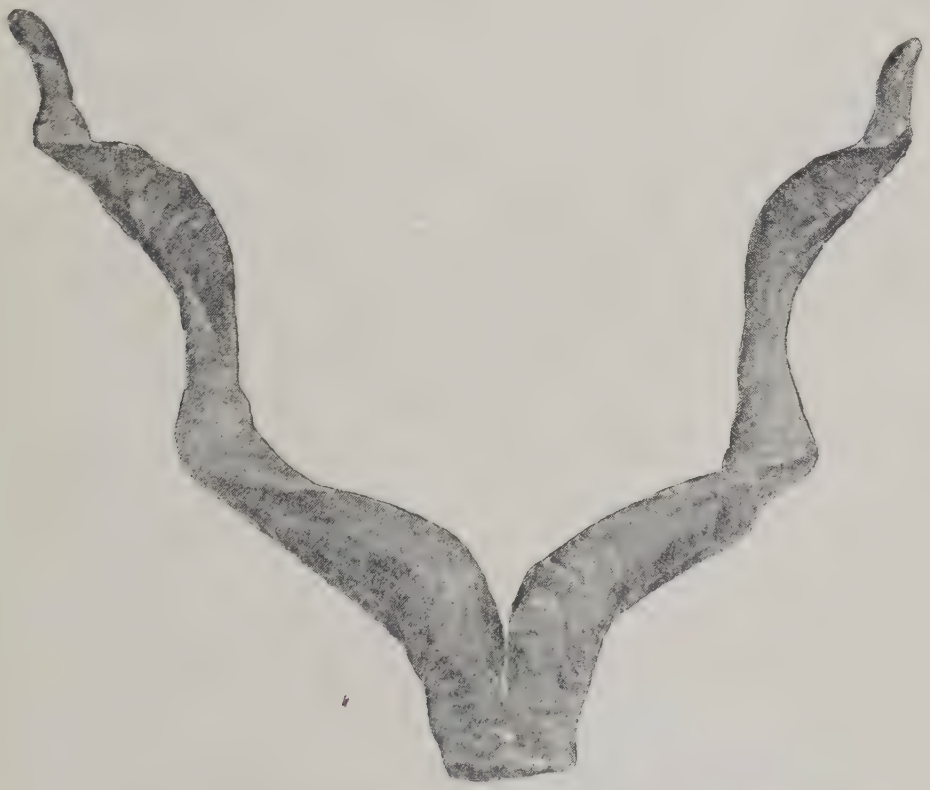
Having spotted a fine buck, the only thing to do is to follow it day after day and give up all idea of shooting inferior animals, until the big head is brought to bag or all trace of the animal has been lost,—try patiently.

Luck does not always hold good, and this was the case in a very unlucky trip during which a big Markhor was followed for several days. The continual change of wind was fatal, and eventually the beast vanished. Another fine Markhor had been found higher up the nullah where stalking was easier. The shot was taken from a cliff with the buck below, as it was browsing with head slightly downwards, the bullet went through a horn and the core and then smashed the skull below the second horn. The undamaged horn measured 52 inches.

There are the grandest views in the country above Dumoot, this valley is also the field naturalist's paradise, for here rare birds breed, and numbers of rodents live. Now all the country is closed to the visitor, Elsewhere there are many places where field research can be carried out, but very few places where the big-horned Ibex and Markhor can be shot.

The sketches which were made from photographs represent horns from Astor and the Kajnag, and are of about the same size, *i.e.*, measurements.

PIR PANJAL OR KAJNAG MARKHOR (*C. falconeri cashmiriensis.*)



A pair of Horns from Kajnag. Length a little over 53″.

The horns of this variety are often very long and vary greatly in curvature. As a rule they do not girth as much as those from Gilgit and Baltistan.

The Kajnag and Shamshibri are now under the careful supervision of the Game Preservation Department from whom copies of the rules in force can be obtained.

The Kajnag which is adjacent to the Vale of Kashmir and close to the main road was overshot in the eighties. There are apparently very few good heads left. However, when Malangan in the Kajnag is re-opened for sport, the big bucks may again be found.

Measurements of Markhor Horns from Kajnag.

Index No.	Measurements			Name of Sportsman	Date	Locality, &c.
	Length	Girth	Tip to Tip			
1	59	10¾	36	Col. S. Turnbull..	1903	Kajnag.
2	59	10½	..	Major Sherves	1888	Malangan, Kajnag
3	58	10¾	41¼	Major Knox	1909	Kajnag.
4	57½	10	39½	H. McLaughlin	1907	Kajnag(Malangan)
5	56	..	..	W. Mitchell	1888	Malangan.
6	56	10½	..	Major Sherves	1888	Kajnag.
7	55½	10½	40	P. M. Hall	1916	Shamshibri. †
8	53½	10½	32	A. E. Ward	1881	Malangan.
9	52½	..	..	W. Mitchell	1888	Malangan.
10	52	..	..	Offered for sale at Rampur in a shop.	1880	
11	51	10½	..	A. E. Ward	1887	Shamshibri.
12	50	10	..	A. E. Ward	1881	Malangan.

Records of horns from the Pir Panjal* do not exist. The only two pairs of horns of a fairly good size known of, measured 45 inches. One was shot long ago after a prolonged search for a good head, and certainly was bigger than any other seen. The other was brought in to Srinagar either in 1886 or 1887 and was measured by Henri Dauvergne.

The late Captain S. G. Allan often talked about his visits to the Pir Panjal, but stated he had seen no good Markhor heads even in the sixties.

A few but very few big bucks are to be found in Poonch and are protected by the Rajah. So let a return be made to the Kajnag. Accompanied by a friend a move was made to the ground opposite to Rampur on the old Abbottabad route. Report had told of many big bucks high up in the Malangan cliffs, and in other rocky mountains.

†(NOTE—Shamshibri Ranges are next to the Kajnag.)

* In Rowland Ward's Records of Big Game the largest head from the Pir Panjal measures 53″ (Maj. F. W. Walshe); other good heads from this area are 51⅜″ (Sir Edmund Loder) and 48½″ (Mr. J. G. Millais).

The autumn was coming on, the mists had cleared off, the fresh morning air was delightful and hope was in the ascendant. A well known old shikari who was lame, but who could get over any bad ground met the camp and gave his news.

"One big buck quite close and three a little further off!" His idea of close was probably 10 miles and five thousand feet up the mountain, the little further off "turned out to mean a very long day's climb, and then two or three hours amongst almost vertical cliffs."

The single buck was found and bagged by the camp companion, the term "big" was an exaggeration, still the horns were well over 45 inches.

Before daylight on the second morning after a very long tramp on the previous day the camp was on the alert. A few sticks were lighted and charcoal made for the samavars; hot tea is an excellent beverage at early dawn.

The start was made as soon as it was possible to see the exact place to tread, for the rocks although not very difficult, were rather friable and unsafe.

High up under the main cliffs there is an open slope of some size, where grass and stunted birch grow, and where young birch bushes are crushed down by the snow and lie in tangled heaps. The slope can only be approached from one side. For some distance above the approachable side, the ground was broken up by rocks. It was there the three bucks were found. The lame old shikari "Rahmana" has now passed away, but he was generally very reliable and on this occasion absolutely so. One buck was standing up close to a lot of birch, the other two were resting on an open part of the slope.

By crawling and dodging from cover to cover not more than 80 yards intervened between the rifle and the standing buck. It seemed to be almost impossible to miss, but the buck did not appear to even flinch but stood still—on receiving the second bullet he subsided on to his side. Both bullets had hit behind the shoulder, the first had probably struck some nerve centre.

Naturally the other two Markhor were off at once, but owing to the nature of the ground they had to come broadside on and slightly above. This gave time to get hold of the second rifle, and drop the leading animal which fell dead and rolled into the dried birch.

The third buck was still within shooting range but whether hit or not it is difficult to say and before there was time to reload he was out of sight. The shikari rushed forward and trod on a spike of birch wood which penetrated his grass shoe deep into the instep.

By means of forceps which were in a roll of taxidermist tools the spike was pulled out, cotton wool and a bandage made the lame man fairly comfortable and when this was finished, Ramana began to talk. He would have it the third buck was hit, and could not get away.

Leaving the old man to take off the heads and skins of the slain the living buck was followed. The rocks were bad going from the first and after a short distance quite impossible, but the buck had gone on until he had reached a ledge, and there he stood, possibly over 300 yards away. He had crossed with his right side towards the rifle, but now as he turned round, his left side was exposed, but the glasses showed no wound which if it existed was probably in the middle of his body, for his legs were intact.

The shot was too long for a rifle only sighted up to 200 yards, and the result of firing all but two or three cartridges only ended in hard smacks against the rocks, so leaving the coolie, who seemed reasonably acute, to watch, a return was made to help the doubly lamed Rahmana. It was intended to return the next morning and to expend more cartridges, for when the coolie reached the temporary camp, where the night was spent, he said the buck was still there. In the morning he was not to be seen, and both men declared that he must have fallen over. Some days afterwards broken pieces of one horn, and a damaged

head with half a second horn were brought into camp. The chances are this was the last of the three big bucks that were "a little further off," but who knows what tricks may have been played by the shikaris.

On another occasion three shootable Markhor and two small ones were said to be in a ravine not far from camp. This was years later. One head of 51 inches was obtained and the rest left, for Markhor were scarcer than in 1881.

Old Ramana was still going and came on the trip. His foot had healed at once, still it was probable he had experienced a great deal of pain, which he bore without a murmur. No account of Markhor shooting would be complete without mentioning 'Kennard,' who wintered in Baltistan and shot many Ibex and Markhor. A number of the Markhor were got on the Indus or rather just above the cliffs. Amongst the heads were some fine massive wide spreading specimens, but the measurements are not just now available. The late Mr. Kennard probably shot more of the Hill Goats than any other European; for he had the cream of the sport in the days when firearms of precision were scarce on the frontier. He also shot in the winter season, for there were no game laws, few men thought of the future and the legion of sportsmen who now come to Kashmir. Two hundred was then the limit of the number of visitors who could visit Kashmir. Many of these two hundred never went outside the boundary of the Vale or even to the Wardwan and Soroo and it was often possible to shoot over the greater part of Ladak and Baltistan without meeting more than two or three other sportsmen.

No. 350. The Tahr (*Hemitragus jemlaicus.*)

Horns of Tahr (*H. jemlaicus*) 13½" (From the Society's collection)

The *Kras* or *Jagla* of Kashmir.

The *Kart* in the country bordering on Chamba.

The *Jhula* of the United Province hills, but this name is generally used to designate the old males.

The Pir Panjal, Kishtwar-Dachan and the lower Wardwan hold many tahr. On page 509 in the volume on Mammals (Fauna of British India Series) there is a drawing of this thick set goat which however is very active in the precipice.

The trophy is a poor one, unless set up with the long hair of the neck. The Thar is an evil smelling beast, but one that gives grand sport to those who love scrambling amongst the rocky forests, where deodars grow, and where pheasants can be met with.

Index No.	Measurements			Name of Sportsman	Date	Locality, &c.
	Length	Girth	Tip to Tip			
1	14¾	9	8	Capt. I. M. Cameron	1906	
2	14¾	7¾	6	H. D. Anderson ..	1914	
3	14⅝	..	..	Capt. Dennys ..	1911	
4	14½	..	..	Capt. Finlay ..	1910	
5	14½	9¼	6⅓	Capt. Lewis ..	1904	
6	14½	9	7½	Capt. Stockwell ..	1908	
7	14⅛	8½	6	Capt. H. Percy ..	1904	
8	14	9	5½	Major Drew ..	1907	
9	14	8½	..	P. F. Hadow ..	1908	
10	14	..	..	Capt. Sturges ..	1921	

It is refreshing to be able to enter on the list of horns one of 14 inches shot in 1921. A very large number of heads 12 inches to 14 inches could be entered. Except for those who are keen on records there is a satisfaction in shooting any old Thar with a head over 12 inches, and many such are to be found.

In former years when Kishtwar, which is attached to the Jammu province, was closed to the public, very few good heads were to be got. The lower Wardwan and the Pir range held little worth shooting, but one head of over 13½ inches can be brought to mind, and that was shot in the Gwee-nye in the Wardwan Hills.

A Collector's Trip on the Borders of Kishtwar and Thar Shooting.

Not far from where the Panjari-dar Mountain marks the boundary, a comfortable camp was pitched amongst fine horse chestnuts and deodars, the object in view being to collect various small beasts and birds, and if luck was good a brown bear or in fact anything that presented itself.

An expert in skinning was included in the following, for it is tiring work to be out early and inspect the many traps, then go out after birds and come back to skin and label them.

On arrival, it was decided to halt and sort out what might be required; there were no villages, the sheep were not as yet on their grazing grounds, and by luck no one was about.

During the halt, hours were spent in trying to find where the Speckled Wood pigeon made their nests. A pair of Bonelli's Eagles were located in some rocks, which chased a Monal pheasant which was put up, but they failed as the quarry dropped suddenly and took shelter in the forest. A brown bear and also a Serow were seen, the latter being put up by the sound of the collector's

gun, and disappearing before a rifle could be handled. The bear was left alone as it was a female.

Marching on the next day through the forest of mixed trees was very pleasant, but nothing was seen until emerging from the trees a stream was reached and the sound of a waterfall heard.

Above the waterfall—there was no crossing below the fall—was a steep smooth slab of rock over which a wide stream of water flowed.

On the far side of this slippery and smooth rock a herd of Thar were feeding quite unconscious of danger, whilst beyond them and above them were broken up cliffs. Between the forest and the stream there was sufficient scrub to cover the stalker, but the distance from the edge of the water to where the Thar were feeding was too far for a certain shot. Sitting amongst the bushes and watching was pleasant enough only for a short time, but this had to be endured or the idea of getting those Thar had to be given up. After a long wait the animals came towards the water, it seemed to be impossible that they could get a footing on the smooth slope. Anyway three bucks came to the edge of the water and the leading one was not more than 50 yards away when he was shot, and fell forward into the water and in a second was at once swept downwards. A second buck hard hit, went upwards and then lay down perhaps two hundred yards away. Nothing definite could be seen, and several shots were necessary before he rolled out of the rocks on to fairly level ground below, and lay dead.

The Kishtwaris are Hindus, so no throat cutting operations were necessary. A coolie was left to try and scare off vultures, whilst the rest of the party descended the ravine to look for the first Thar that had fallen. Below where the smooth rock ended was a mass of snow. Adjacent to the rock it had been melted by the water, leaving an open space and, in this,between rock and snow,the body of the Thar was fixed. Evidently time would be required to get it out, so crossing on the snow, a return was made and the second Thar was picked up and sent into the main valley below. Without appliances there was no getting at the first Tharand it was not until a pole had been placed across the chasm and the guy ropes of the tents used, that a man could descend and fasten the ropes round the body, which could then be hauled up ; but this work had to be deferred until the next morning when a bedraggled mass of hair and goat was extracted.

The snow slide was a boon, for it not only formed a bridge over the side stream where the Thar were found, but also over the main water of the valley, for the junction of the two waters was close at hand. During various trips on three occasions animals have fallen into crevasses or into the water below snow bridges ; twice Thar which were got out dead, but the third time a bear which unfortunately was wounded had to be left, poor beast !

There was plenty to do in camp for a day or two, and a fresh start was to have been made on the morning of the third day but the post coolie reported he had seen a solitary Thar down the valley.

The road, or rather cattle track which followed the small river was taken, then a halt was made and the glass got out, after along scrutiny the Thar was seen lying down under a deodar tree.

To suit the wind the stalk had to be upwards. When almost within shootable distance the accommodating animal got up and crossed the narrow nullah immediately above. A long shot was taken, and the Thar fell, rolling down the steep incline to within a few yards of where we stood. The distance probably was over estimated for the bullet hit high up where the neck joined the body. The skin was given to the postal runner, as he explained that Thar skins, when cut into strips, were used to fasten the yoke of the ploughs on the cattle as caste forbade the hides of cows being touched.

Three Thar heads were sufficient. As the five mountains (Panjendar) were only about 8 or 10 miles further up, the camp was taken on—what a difference there

is between the preserved Deodar Forests, and the unprotected birch. The black dead stems of the birch were a dismal sight. The cattle and goat herds had stripped off the small boughs of the birch and consequently the trees were ruined. Maple and horse chestnut trees were cut to pieces and were monuments of destruction standing stark and drear in the snow.

This devastation is going on almost everywhere and has ruined many and many a fine Forest.

A return was made by another valley. Thar were seen and left alone. A goral and a bear were shot. This ended a very pleasant trip and a most successful result from a field naturalist's point of view, for the upper valleys of Kishtwar hold many birds that are seldom to be seen in Kashmir. The views of the mountain peaks of Brahma are very grand—the people are interesting and talkative.

(*To be continued*)

INDIAN DRAGONFLIES.

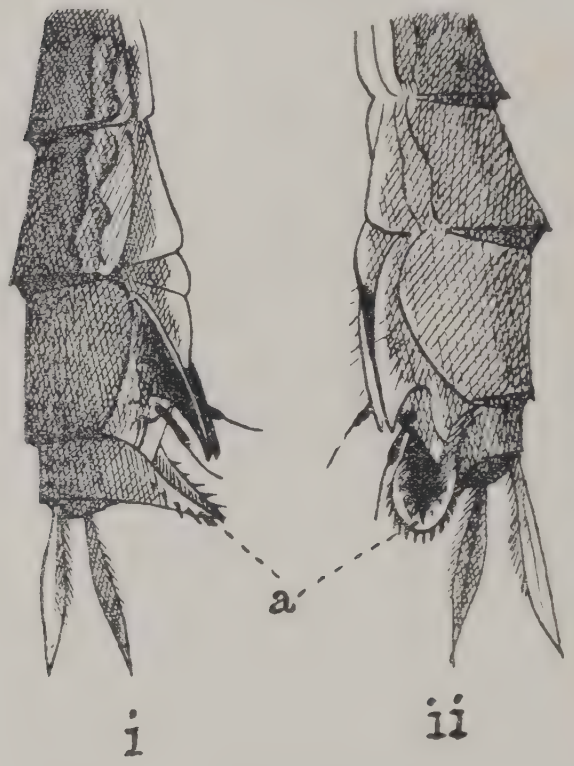
BY

MAJOR F. C. FRASER, I.M.S., F.E.S.

PART XIII.

(Continued from page 492 of this Volume.)

(With 5 Text-figures.)



* Fig. 1. i. Terminal segments of abdomen of *Æschna erythromelas* showing (*a*) dentigerous plate. ii. The same of *Æschna ornithocephala.*

Group—BRACHYTRON.

The genera included in this group are characterized by the symmetrical forking of *Rs* (5th nervure) and by the presence of only a single row of cells between *Rs* and *Rspl* (5th nervure and 5*a*) and between *Mir* and *Mspl* (7th nervure and 7*a*). (An exception is *Jagoria* in which *Rs* is unforked.)

The eyes are generally smaller and less contiguous than in group *Anax*; the frons usually broad or very broad, the occiput small and simple. The wings are long and broad or narrow, the reticulation open or close, the base of the hindwing usually excavate and angulated in the male, rounded in the female, the stigma variable, long and narrow or short and broad.

The dentigerous plate of the female is variable, subrotundate, denticulate or forked. The anal superior appendages of the male usually lanceolate, the inferior subtriangular.

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* This figure was omitted from the previous part and should have been included under the description of *Æschna erythromelas*. Vol. XXVIII, No. 2, p. 490,

Genus—JAGORIA.

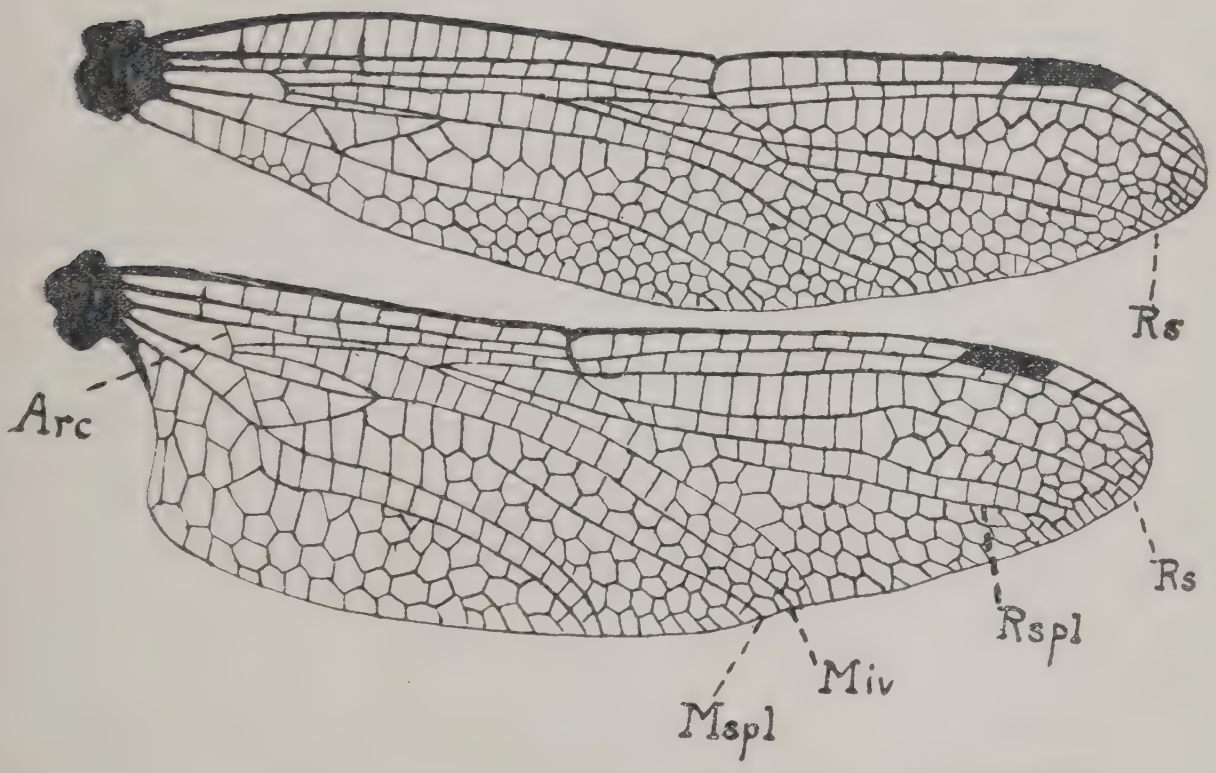


Fig. 2. Wings of *Jagoria pœciloptera*, Karsch. ♀ (x 2·5).

Jagoria, Karsch, Ent. Nachr., xv., p. 238, (1889); Laidlaw, Rec. Ind. Mus., Vol. xxii, p. 76, (1921); Martin, Cat. Coll. Selys, *Æschnines* p. 155, (1908).

Head moderately large; eyes large, broadly or moderately contiguous. Wings moderately long and broad, reticulation moderately open, trigones short, with 3-5 cells, basal space (prearcular) entire, 2 cubital nervures in all wings, hypertrigones entire or traversed by 1-2 nervures, *Rs* not bifurcated, only 1 row of cells between *Rs* and *Rspl*, 1-2 rows between *Miv* and *Mspl*, membrane short and narrow, not usually extending along the whole length of the wing—base, stigma braced, moderately short and thick, anal triangle of 3 cells, anal border moderately excavate.

Legs long and rather slender. Thorax robust.

Abdomen cylindrical, only slightly tumid at the base, constricted at the 3rd segment, widening again from 4 to 6 and then narrow and cylindrical as far as the anal end. Superior anal appendages longer than the 10th abdominal segment, variable in shape, the inferior more or less cylindrical, long and bifid, rather more than half the length of the superior.

The 10th abdominal segment in the female prolonged into a finely denticulate plate below. Anal appendages of female long and foliate.

Jagoria martini, Laid., Rec. Ind. Mus., Vol. xxii, p. 76-77, (1921).

Female only known. Length of abdomen 40 mm. Hindwing 40 mm.

Head. Labium, labrum and epistome orange brown, the upper surface of frons marked with a broad "T" shaped mark, brown in front and black against the eyes, frons yellowish, vesicle and occiput black, the latter fringed with a tuft of black hairs.

Prothorax dark brown.

Thorax dark brown marked with a pair of oblong, oval, bluish green, antehumeral bands which converge above but do not quite meet the mid-dorsal carina. From near the upper end of these bands, a pair of similar coloured, short, narrow bands run towards the humeral suture. On the sides two vivid green, broad bands, one at the middle and the other covering the entire metepimeron. Beneath orange brown.

Abdomen black above, orange brown beneath. Segment 1 marked laterally with vivid, greenish yellow, segment 2 with a lateral, yellow band and a pair of small, semilunar, green, apical spots, segments 4 to 6 with similar green spots but smaller on the latter. In addition segments 2 to 4 have each a pair of narrow, transverse, green marks at about their centre and there is a small, basal, yellowish green, triangular mark on the 2nd segment. Segments 7 to 10 unmarked.

Anal appendages small, about 2 mm. long.

Dentigerous plate on the 10th abdominal segment almost squarely truncate posteriorly and is furnished at the apex with about 15 small, irregularly placed teeth.

Legs black, coxae and trochanters and the bases of femora brownish.

Wings hyaline, the bases saffronated as far out as the 1st antenodal nervure, trigones of the forewings 3-celled, of the hind 4-celled, hypertrigones entire, 16 to 17 antenodal nervures to the forewings, 9 to 11 in the hind, 7 to 8 postnodal nervures to forewings, 8 to 10 in the hind, stigma dark brown.

Hab. Darjiling District. Described from a single specimen taken on Tiger Hill, Darjiling, 8,300,′ 26-vi-18 by Mr. S. W. Kemp. Type in Indian Museum.

Genus—PERIÆSCHNA.

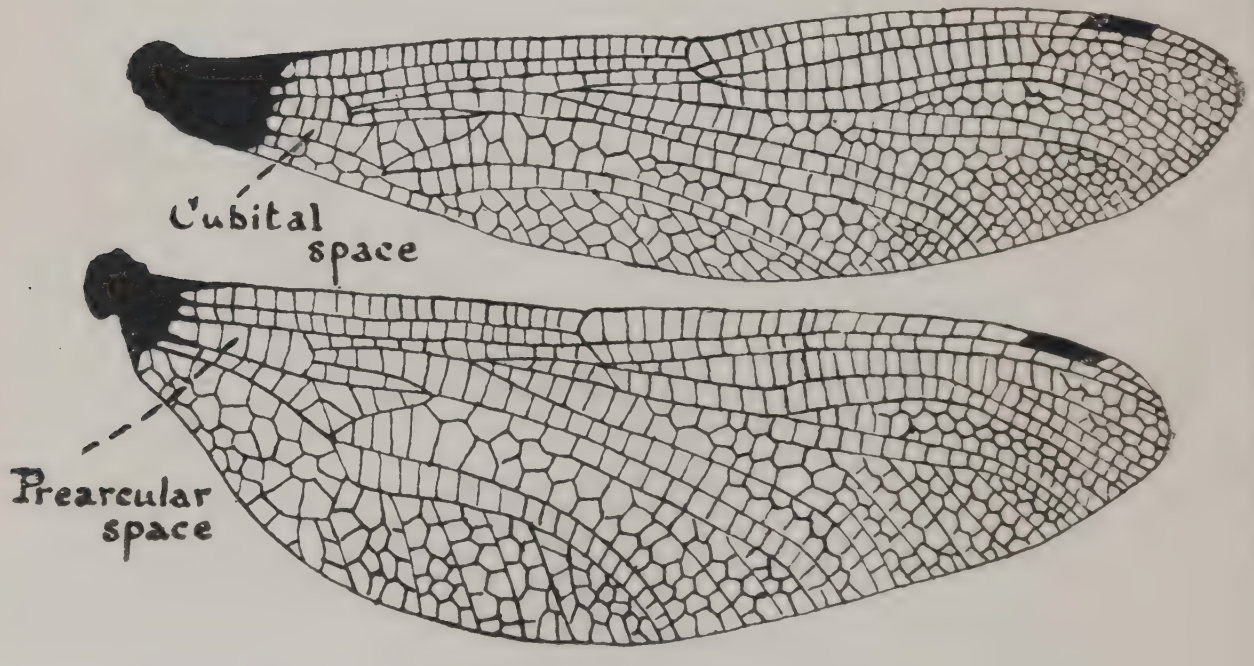


Fig. 3. Wings of *Periæschna magdalena*, Martin. ♀ (x 2·5).

Periæschna, Martin Cat. Coll. Selys, *Æschnines*, xix, xx, p. 157, (1908) Laidlaw, Rec. Ind. Mus. Vol. xxii, p. 81 (1921).

Female. Head globular; eyes broadly contiguous; occiput small.

Wings broad, a little rounded at the apices, reticulation open, trigones, elongated, of 5 to 6 cells, prearcular and cubital spaces and hypertrigones traversed, the latter 3 times. *Rs* bifurcated nearer the node than the stigma or at

least halfway between these two structures, *Rspl* running parallel to *Rs* and only 1 row of cells between them, stigma moderately short and stout, membrane moderately short and narrow.

Legs short and robust. Abdomen slender. Anal appendages short and slender. Dentigerous plate forked with fine, needle-like branches resembling those found in *Gynacantha*.

Periæschna magdalena, Martin, Cat. Coll. Selys, *Æschnines*, xix, xx, p. 157, pl. vi, fig. 22 ; Laidlaw, Rec. Ind. Mus. Vol. xxii, p. 81, (1921).

Female. Abdomen 67 mm. Hindwing 44 mm.

Head. Labrum, labium, face and frons reddish brown, the base of the latter black with a medial prolongation forward.

Prothorax and thorax blackish brown marked with a narrow, yellow, antehumeral stripe on each side and 2 broad, yellow stripes laterally.

Legs blackish brown, reddish at the bases.

Abdomen tumid at the base, slightly constricted at the 3rd segment, and thereafter cylindrical as far as the anal end. Ground colour black marked with yellow as follows :—segments 1 and 2 with the sides broadly yellow and the dorsal carina finely, the 3rd segment with a basal, lateral spot, segments 4 to 7 with similar but less evident spots, segments 8 to 10 unmarked.

Superior anal appendages fine and short, but slightly longer than the 10th segment which is very short.

Wings enfumed, costa dark brown, stigma reddish, short and stout. All wings have a basal brown marking which extends outwards as far as the 1st antenodal nervure ; membrane white.

Type female in Martin's collection Tonkin, Assam. Dr. Laidlaw reports a pair from Tura, Garo Hills, Assam, which are now in the Indian Museum.

Genus--AUSTROÆSCHNA.

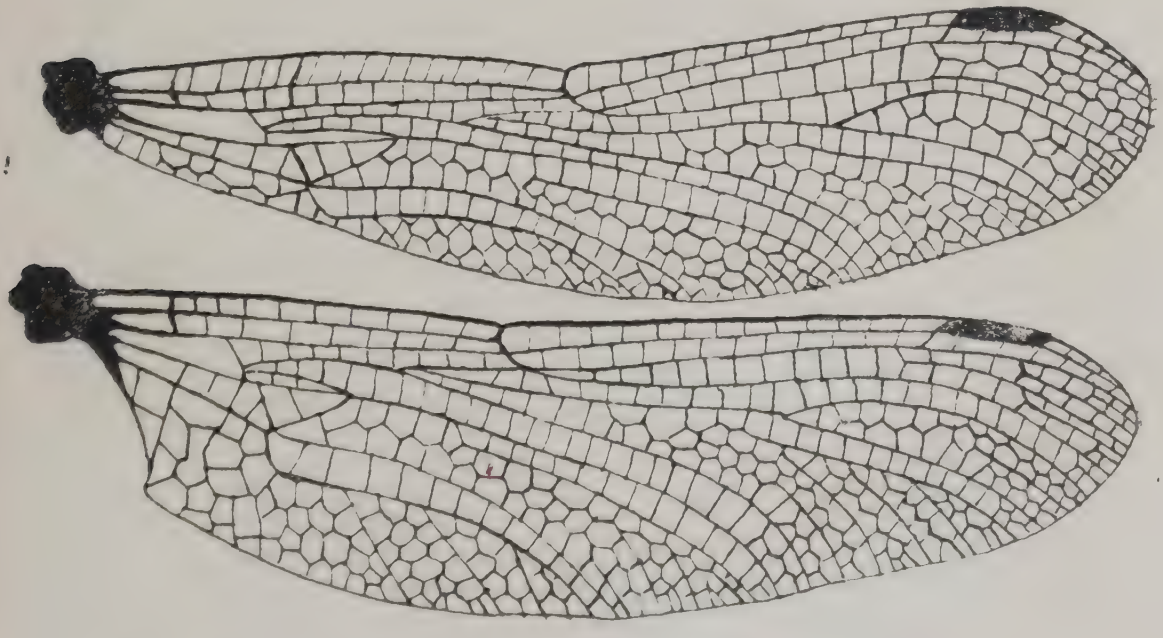


Fig. 4. Wings of *Austroæschna intersedens*, Selys. (x 2·5).

Austroaeschna, Selys, Bull. Acad, Belg. Vol. 3. p. 732. (1883).
Acanthæschna, Selys, ibid. p. 731, (1883).
Planæschna, Maclachlan, Ann. Mag. Nat. Hist.), Vol. 27 (1895).
Dromæschna, Forster, Ann. Soc. Ent. Belg.), Vol. 52 (1908).
Austroæschna, Martin, Cat. Coll. Selys.), Vol. xix, xx (1908).

Eyes slightly contiguous ; occiput small ; frons narrow as viewed from above ; face narrow, subglobular, fringed around with long hairs.

Abdomen slender, tumid at the base, constricted markedly at the 3rd segment and from thence cylindrical till the end. Anal superior appendages long and slender, much longer than the 10th segment, inferior narrow and truncate, triangular. The dorsum of the 10th segment with a prominent carina. Oreillets robust.

Wings moderately narrow, reticulation rather close ; trigones short, of 2 to 4 cells ; prearcular space entire ; cubital space and hypertrigones traversed : *Rs* bifurcated well before the stigma ; only a single row of cells between *Rs* and *Rspl* and between *Miv* and *Mspl* ; anal border markedly notched ; anal triangle of 3 cells ; membrane short and slender, not quite the length of the anal border.

Superior appendages long and slender, longer than the 10th segment ; inferior short, truncate, triangular. Dentigerous plate of female subrounded, finely denticulate. Appendages short.

Hab. Australia. Represented by a single species within Indian limits.

Austroæschna intersedens, Martin, l. c. p. 101, pl. iv., fig. 14.; Laidlaw, Rec. Ind. Mus., Vol. xxii, p. 79, (1921).

Male. Abdomen 40 mm. Hindwing 37 mm.

Head. Eyes green, moderately contiguous ; labium olivaceous ; labrum, face and frons bright yellow, the latter which is raised into a fine point at its centre, smoky brown along the crest. The crest and borders of the face fringed with a ruff of long, black hairs.

Prothorax brown.

Thorax maroon brown marked with bright yellow as follows :—2 antehumeral stripes on the front of dorsum, separated by the dorsal carina and lying parallel to one another, the interalar sinus, tergum and some small spots at the bases of the wings. Laterally two broad stripes, one of which lies between the humeral and first lateral suture and the other covers the whole of the metepimeron.

Wings hyaline, stigma black, 3 cells in trigone of forewing, 4 in the hind, loop very small, of 4 cells, 4 cubital cells in forewing, 4 to 5 in the hind; nodal index:— $\frac{12\text{–}18}{13\text{–}11}$ $\frac{17\text{–}13}{11\text{–}12}$; I row of cells between *Rs* and *Rspl* ; 2 rows of cells between the bifurcation of *Rs*.

Abdomen brownish black marked with yellow as follows :—1st segment with a quadrate spot low down on the sides and a middorsal streak, 2nd segment with an apical, subtriangular spot low down on the sides and a middorsal streak which gradually tapers apically, the oreillets are also yellow, 3rd to 10th segments with a continuation of the fine, middorsal yellow line which broadens into a small triangle on either side the dorsal carina about the middle of the segments. In addition, there are on segments 3 to 9 lateral, subapical spots.

Legs dark brown, the coxae and trochanters yellow and at the base of the mid pair this yellow is prolonged into the thorax for a short distance.

Anal appendages long, sinuous and narrow, blackish brown. The inferior long, not quite half the length of the superior, narrow and triangular.

Female very similar to the male, the abdomen being stouter at the base, not constricted at the 3rd segment, the markings rather more pronounced. Anal appendages small, lanceolate, pointed.

Dentigerous plate simple, prolonged into a spout-like structure, armed with about 8 small spines.

Hab. Assam, Cherrapunji and Shillong.

Genus—CEPHALÆSCHNA.

Cephalæschna, Selys, Bull. Acad. Belg., (3), v., p. 739, (1883).

Caliæschna, Selys, et Martin, Cat. Coll. Selys, *Æschnines*, xix, xx (1908).

Cephalæschna, Laid., Rec. Ind. Mus., Vol. xxii, pp. 77-79, (1921).

Eyes broadly contiguous ; frons raised in front or projecting markedly ; occiput small, its hinder border slightly raised.

Thorax short, robust.

Abdomen long and slender in the male, stout and robust in the female. Slightly tumid at the base in the male and slightly constricted at the third segment, the 10th segment with a prominent middorsal carina. Oreillets of male prominent, the posterior border armed with 5 to 6 robust spines.

Anal appendages nearly as long as the 9th and 10th segments, slender at the base, broadening inwardly after the first third, with a prominent mid-rib, pointed at the apex.

Wings hyaline or enfumed ; stigma markedly short usually braced ; trigones with 3 to 5 cells ; hypertrigones traversed three times ; are strongly angulated ; arcular space traversed usually 5 times ; *Rs* forked, 2 rows of cells between the fork; loop with 5 to 8 cells, rather small, and stunted ; a basal antenodal nervure of the first series always present and continuous with the first traversing nervure of the basal (arcular) space ; base of hindwing in the male obtusely angular ; rounded in the female ; anal triangle with 3 cells ; *Rspl* and *Mspl* running parallel with *Rs* and *Miv* respectively and enclosing 1 or rarely 2 rows of cells especially near the margin of the wing ; antenodal and postnodal nervures numerous.

Legs long and rather slim ; hind femora with a row of closely-set, robust, short spines and 2 or 3 longer ones at the distal end ; tibial spines long and numerous : claw-hooks robust, situated nearer the base than apex, at which point the claws rapidly taper.

Dentigerous plate of the female rounded and subdenticulate.

Cephalæschna acutifrons, Martin, l. c., Ris. Supp. Ent., No. 5, pp. 55-56, tab. 2, fig. 5, (1916) ; Laid. l. c. (1921).

Female. (Male unknown.) Length of abdomen 52 mm., of hindwing 47 mm.

Face and frons olivaceous yellow, no markings above the frons which projects in front somewhat like the bows of a ship.

Thorax dark brown with a humeral stripe of bright green on each side and two lateral stripes of yellow bordered with vivid green.

Legs reddish yellow.

Wings broad, especially the hind, hyaline but saffronated at the bases ; stigma small, reddish brown ; costa orange ; 25 antenodal nervures and 21 postnodals in the forewing, 19 antenodal and 24 postnodal nervures in the hind.

Abdomen broad and tumid at the base, the 2nd segment somewhat ovoid, the 3rd slightly constricted, dark brown marked with yellow as follows :—the 2nd segment with 2 small, linear, yellow spots at the centre and 2 others at the base, segments 3 to 9 have similar spots, the medial ones very small and linear, the basal larger and more semilunar in form.

Anal appendages very small, linear, dark brown.

Hab. Type female in the collection of Selys, labelled, India, is probably from Assam or Bengal.

Cephalæschna masoni, Martin, *Caliæschna*, Cat. Coll. Selys, *Aeschnines*, fig. 104, Pl. 111, fig. 12, p.111 ; Laid. Rec. Ind. Mus., Vol. xxii, pp. 77-78, (1921).

Male. Length of abdomen 55 mm., of hindwing 41 mm.

Face yellowish, a fringe of hairs round its circumference, flattened ; frons yellow bordered finely with black.

Thorax blackish brown marked with a humeral band of green in front on each side and two lateral bands of the same colour.

Wings rather broad, hyaline ; stigma blackish brown, very short ; membrane short, white ; anal triangle of 5 cells ; forking of *Rs* begins well before the stigma ;

21 antenodal nervures and 11 postnodals to the forewing, 15 antenodal and 16 postnodal nervures to the hind.

Abdomen long and slender, black, the 1st segment with reddish hair, the 2nd with a basal, dorsal, yellow triangle, 2 transverse, linear spots of the same colour on each side of the dorsal crest at the middle of the segment and at the apical end, segments 3 to 9 with a linear spot of yellow on each side of the dorsal carina about the middle of the segment and a larger semilunar spot at the apical end nearly confluent across the dorsal carina, 10 unspotted.

Superior anal appendages long, slender at the base, then broadening spatulate-wise after the first third, the apex rounded, brown. Inferior appendage half as long as the superior, triangular.

Female unknown. It is possible that *C. acutifrons* is the female of *C. masoni*. The venation differs rather widely but this character is so variable a factor that too much importance should not be given to it.

Type male in the Selysian collection. Assam.

Cephalæschna lugubris, Martin, 110, fig. 103, Syn. Cat. Coll. Selys.
Æschnines, xix, xx (1908).
Cephalœschna sikkima, Selys, in. litt.
Cephalœschna lugubris, Laid., Rec. Ind. Mus., Vol. xxii, p. 78, (1921).

Male. Length of abdomen 48-51 mm., hindwing 41 mm.

Head. Labrum, labium and lower epistome yellow, upper epistome green, frons in front shiny black, above yellow bordered with black, frons raised and narrow; occiput small, black.

Thorax short, blackish brown, marked with a green antehumeral band on either side of the front and laterally with two broad, green bands.

Legs blackish brown, the bases of femora reddish.

Wings hyaline, tinted with brown; stigma very short; brown; membrane yellowish, trigones made up of 4 cells; anal triangle with 3 cells; 2 rows of cells between the forking of *Rs*; 21-25 antenodal nervures and 11 postnodals in the forewings, 18-19 antenodals and 13-15 postnodals in the hind.

Abdomen long and slender, slightly tumid at the base, a little constricted at the 3rd segment, black marked with green as follows:—the 1st segment with a central, yellow spot, the 2nd with a dorsal, green line broken at its middle, 2 linear transverse streaks at the centre of the segment, separated by the middorsal carina, and finally an apical, green annule, segments 3 to 8 with, similar, central, linear marks and apical ring, segments 9 and 10 unmarked, the latter with a prominent, middorsal crest.

Anal appendages brown, nearly as long as the combined length of the last two abdominal segments, very slender at the base, broadly spatulate after the first third, the apex with a small spine. Inferior appendage triangular, about two-thirds the length of the superiors.

Female. Very similar to the male but the abdomen shorter and stouter. The frons without the black stripe above, the face olivaceous green. The 10th abdominal segment very short above. Anal appendages short, very slender filiform and pointed at the apex, brown.

Types in the collections of Martin and Selys.

Hab. Sikkim.

Cephalæschna orbifrons, Selys, Bull. Acad. Belg., (3) v. p. 739 (1883) Martin, Cat. Coll. Selys, *Aeschnines,* xix, xx (1908); Laid. Rec. Ind. Mus., Vol. xxii, p. 78, (1921).

Male. Length of abdomen 45 mm., hindwing 40 mm.

Head: Labrum, labium, epistome and frons uniform olivaceous and quite unmarked; eyes dark olivaceous, broadly contiguous; occiput small, black.

Prothorax dark brown bordered finely with yellow.

Thorax short but robust, dark brown marked with apple green, an antehumeral

streak on either side of the front, broad above, tapering anteriorly. Laterally two broad stripes of the same colour, the first a little interrupted above at its upper corner, the second covering the whole of the metepimeron and just separated from a small spot of green at the base of the hindwing.

Legs blackish brown, the coxae yellow, long and rather slim.

Wings hyaline, rather broad; stigma black, moderately short and usually braced, that of forewing distinctly larger than that of the hind; trigones very variable, that of forewing with 3 to 5 cells, that of the hind with 3 or 4 cells; loop with 5 cells; 2 rows of cells between the forking of *Rs*; 7 to 8 cubital nervures in the forewing, 6 in the hind; hypertrigones traversed 3 times in all wings; reticulation rather close; nodal index :— $\frac{11\text{-}18}{13\text{-}16}$ $\frac{17\text{-}11}{15\text{–}13}$; anal triangle with 3 cells, membrane small, white.

Abdomen long and slim, tumid at the base, constricted at the third segment, dark brown marked with green and yellow as follows :—1st segment broadly greenish yellow on the sides, a dorsal, green triangle at the base and an apical, oval spot of the same colour; 2nd segment with the sides broadly yellowish green and the dorsum with 2 transverse, wedge-shaped spots about the middle, separated by the dorsal crest, a basal irregular spot of green and an apical streak of the same colour on the dorsal carina which is united with an apical, yellow annule; 3rd segment with the basal half of the dorsal carina yellow and a lateral, basal triangle of yellow at its centre, 2 transverse, yellow spots; 4th to 7th segments with the same central, yellow, transverse spots and apical annules of yellow; 8th and 9th segments with only the apical annules; 10th segment with only a lateral, yellow spot.

Anal appendages dark brown, the superior with a prominent mid-rib, narrow at the base, broadening spatulatewise after the first third, the apex bevelled, pointed as seen in profile, the upper surface near the apical end furnished with long, stiff hairs, the inferior about two-thirds the length of the superior, triangular, curling upwards.

Female. Length of abdomen 47-49 mm., hindwing 40-42 mm.

Head : Labrum bright ochreous, rest of face, labium and frons olivaceous as in the male; occiput black. Face as in the male, is fringed with a margin of long, stiff, black hairs.

Rest of thorax and abdomen very much as for the male, the sides of the 2nd segment are less broadly yellow, the sides of the 3rd are more extensively so, reaching as far as the apex, this colour also extends along the sides of the 4th and 5th segments and there is a trace of it on the 6th and 7th, the sides of the 8th to 10th being broadly yellow.

The other markings are as in the male but more pronounced and distinct.

Wings hyaline tinted at the extreme base with pale amber or saffron. Trigone of forewings with 4 to 5 cells, 5 in the hind; loop with 4 to 5 cells; hypertrigones traversed 3 times in all wings; 5 to 6 cells in the anal triangle; nodal index :— $\frac{19\text{–}20}{14\text{–}16}$ $\frac{11\text{–}14}{13\text{–}15}$ $\frac{19\text{–}12}{15\text{–}16}$; a basal, antecostal of the second series in all wings. Membrane ashy, small.

Legs yellow, the joints black as also are the spines on femora and tibiae.

Anal appendages extremely short, filiform, pointed at the apex, brown.

Dentigerous plate rounded and subdenticulate.

Hab. Bengal. Darjiling District. I am indebted to Mr. H. Stevens for the chance of examining a number of these insects. The male as far as I know has not yet been described. The co-type male is in my own collection. I find as a result of my examination that the venation of this species varies very widely and to a less extent, the same applies to the markings. From this I deduce that the number of species described by Martin will probably resolve

themselves into only two species. The coloured illustrations given in the Cat. Coll. Selys both for the *Corduliinæ* and the *Æschninæ* are exceedingly fallacious and to take one instance only, *e.g.*, that of *Hemicordulia asiatica*, no one knowing the living insect would recognise it from the coloured illustration given in the work cited. It will be seen from the above descriptions that they will equally fit either *lugubris*, *acutifrons* or *orbifrons*, not conforming to any entirely. The descriptions have been made from Mr. H. Steven's specimens and as an alternative to giving them specific rank, I have placed them as *C. orbifrons*.

Genus—GYNACANTHÆSCHNA, gen. nov.

Gynacanthæschna, gen. nov.

Cephalæschna, Karsch, Ent. Nachr., xvii, No. 20, pp. 6-7, (1891) ; Laid., Rec. Ind. Mus., Vol. xxii, p. 78, (1921).

Similar to the last genus in most respects but the neuration differs somewhat as also does the dentigerous plate of the female.

Wings rather narrower, usually a little enfumed; stigma markedly short, usually unbraced (or it would be better to say that the brace has shifted outwards and meets the stigma distal to its inner, posterior corner), 2 to 3 nervures converge on the posterior border of the stigma especially in the female ; trigones with 3 cells in the forewings, usually 4 in the hindwing, other points as for *Cephalæschna*.

Dentigerous plate of the female forking into two stout spines very similar to those seen in genus *Gynacantha*.

Gynacanthæschna sikkima, (Karsch.) l. c.

Caliæschna sikkima, Martin, Cat. Col. Selys, *Æschnines*, xix, xx (1908) ; MacLachlan, Ann. Mag Nat. Hist., (6) xvii, pp. 409–425 (1905).

Cephalæschna sikkima et *Cephalæschna sp.* Laid. Rec. Ind. Mus. Vol. xxii, pp. 77-81, (1921).

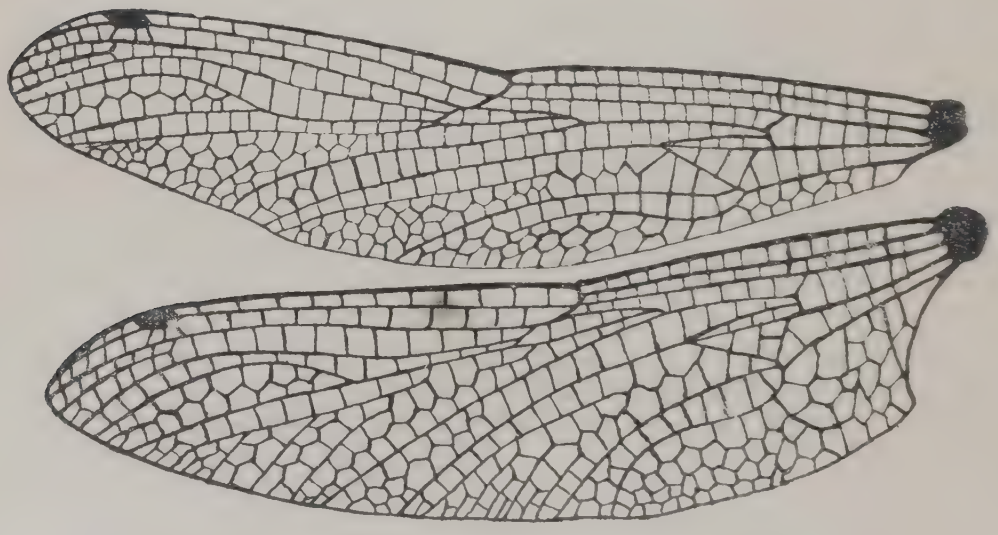


Fig. 5. Wings of *Gynacanthæschna sikkima*, Karsch, (x 2·3).

Male. Length of abdomen 46 mm., hindwing 40 mm.

Head. Labium, labrum, epistome and frons olivaceous brown, the lips somewhat more ochraceous ; occiput black, small, fringed with black hairs ; a fringe of longish, black hair also margins the front crest of the frons and is continued down on either side of the face ; eyes broadly contiguous, olivaceous green.

Prothorax brown margined finely with yellow.

Thorax short but robust, dark chestnut brown marked with green, the dorsum bearing apple green, antehumeral bands which taper slightly forwards, the sides entirely green except for a band of the ground colour at the middle which divides the green into a broad, anterior band and a broader, posterior covering the whole of the metepimeron.

Wings slightly and uniformly enfumed, long and rather narrow; stigma short, dark brown, over 3-4 cells in the forewing, only over 2 or 1½ in the hind, usually unbraced but a sloping nervure meets the stigma a little distal to its inner end, the stigma of the hindwing is much smaller than that of the fore; trigone of forewing traversed regularly 3 times, that of the hind 3 to 4 times and very irregularly, a nervure running from the base may join the first traversing nervure or run backwards to the outer side of the trigone, thus enclosing a triangular cell; membrane white; nodal index:—$\frac{10-18}{13-15}$ $\frac{19-10}{17-13}$; reticulation rather close.

Legs long and rather slim, the femora reddish brown except at the distal ends where they turn dark, tibiæ black, armature of the legs as for *Cephalæschna*.

Abdomen long and slim, tumid at the base, constricted at the 3rd segment, cylindrical thereafter, black marked with green and yellow as follows:—segment 1 broadly yellowish green at the sides, segment 2 also broadly yellow at the side, and the dorsum bearing an apical annule which is contiguous with a short, linear stripe on the dorsal carina, this stripe broken at the centre of the segment and here, on either side of the dorsal carina but not quite meeting it are 2 linear, transverse, yellow lines; segment 3 has an apical, narrow annule, 2 triangular, small, yellow spots situated nearer the base than apex and slightly separated by the dorsal carina, these spots are limited basally by the transverse ridge of the segment and low down on the sides at the end of this ridge is another small, yellow spot, finally at the base, on the sides is a largish, subtriangular spot; segments 4 to 7 have the apical annule and the two spots margining the transverse ridge; segments 8 and 9 have only the apical annule, whilst 10 has merely a small, lateral, yellow spot.

Anal appendages as long or nearly as long as the two last abdominal segments, slim at the base, broadening after the first third especially inward, traversed by a strong midrib, bevelled at the apex where they end in a small point, brown; inferior about two-thirds the length of the superior, curling strongly upwards, triangular.

Female. Length of abdomen 45 to 47 mm., hindwing 41 to 43 mm.

Very similar to the male in colouring but a much bulkier and stouter insect, the abdomen tumid at the base and not constricted at the third segment, rather flattened from side to side, the 8th and 9th segments broadened from above down.

Head. Labium and labrum bright ochreous, the rest of face and frons golden brown; eyes brown; occiput very small, black, with a crest of short black hairs.

Thorax as for the male, the antehumeral bands are of almost the same width throughout but are rapidly pointed at the anterior end.

Legs as for the male but the spines on the femora are more scanty.

Wings long and broader than those of the male, hyaline, the bases saffronated, this paling as far as the arc which is acutely bent; stigma only slightly smaller in the hindwing, the difference in size not nearly as marked as in the male, over 2 cells in all wings, braced but the brace not running from the extreme, proximal end of the stigma, dark brown; trigones with 4 cells in all wings; 7 cells in the loop; *Rs* forked a long way from the stigma, 2 rows of cells between the branches of the fork; nodal index:—Karsch's specimen $\frac{10-18}{12-15}$ $\frac{20-11}{16-13}$; Laidlaw's $\frac{9-19}{13-15}$ $\frac{19-12}{16-13}$; Stevens' $\frac{12-20}{15-15}$ $\frac{20-12}{16-14}$. (It will be seen that the combined number of ante and postnodal nervures in the forewings of the first two speci-

mens comes to 31 for the right wings and 28 for the left whilst in both of the fore-wings of Stevens' specimen there are 32.) There is a basal antenodal of the 2nd series in all wings.

Abdomen black marked with green and yellow as follows :—1st segment with a small, dorsal streak of yellow and the sides broadly apple green ; 2nd segment marked as in the male but the sides more broadly and the basal half green turning gradually to yellow apically ; segments 3 to 7 have an apical, dorsal, yellow triangle formed by the confluence of 2 spots and a transverse, triangular spot on the transverse ridge. (This ridge has been named the "jugum" by Dr. Laidlaw), this spot also formed by the confluence of 2 spots ; segments 8 to 10 are broadly yellow on the sides.

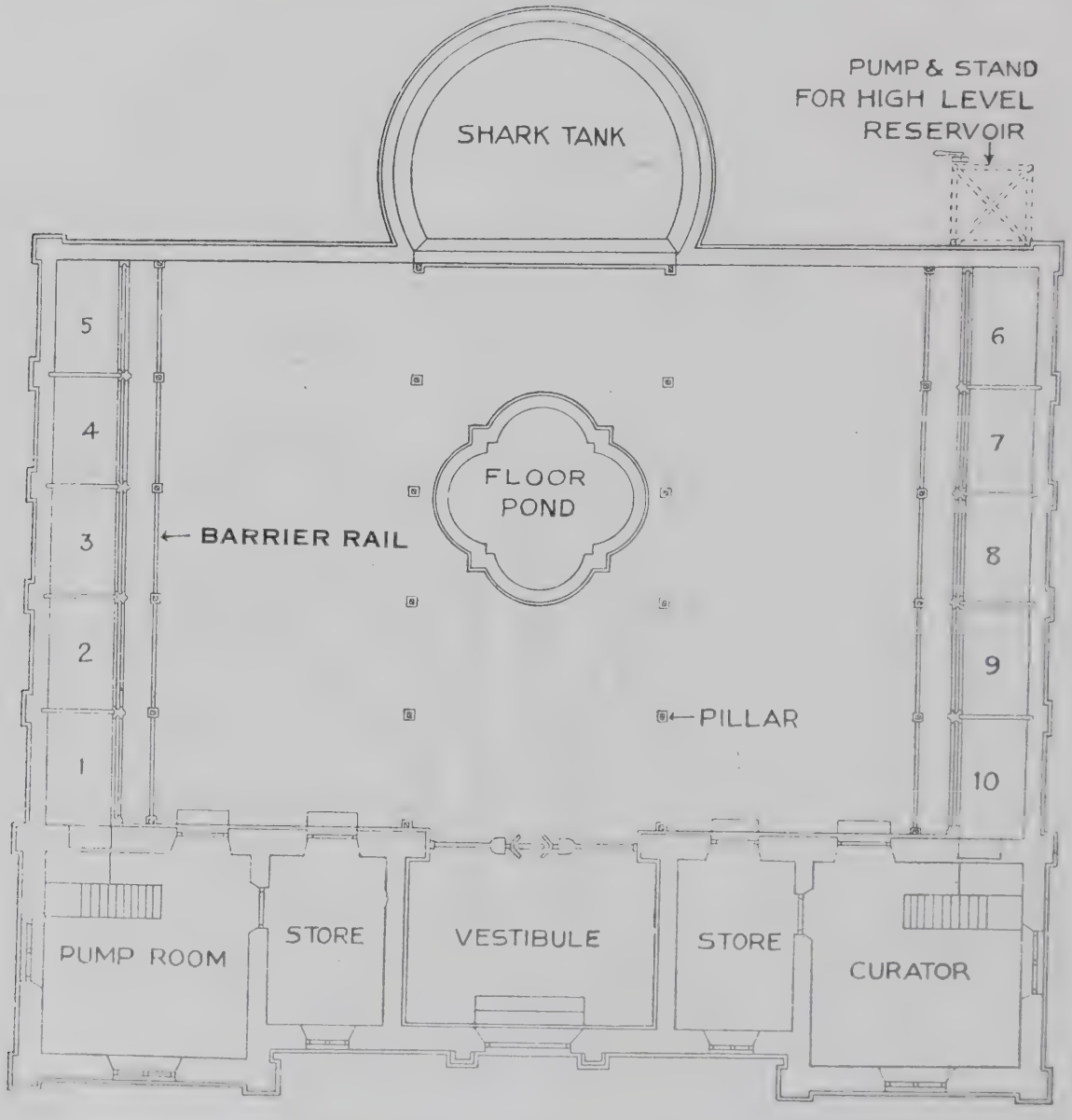
Anal appendages very short and filiform, brown.

Dentigerous plate which has been figured in the preface to the subfamily, strongly forked into robust spines, directed downwards.

Hab. Type from Sikkim, in the Berlin Museum is a female. Laidlaw's specimen is also a female, from Cherrapunji, Assam, now in the Indian Museum. The male, which has not been described before is from Gopaldhara and I am indebted to Mr. H. Stevens for it. I have seen also a female collected by Mr. Inglis above Mangphu, 5,500'.

The differences between the descriptions of Karsch's *C. sikkima* and Laidlaw's *Cephalæschna sp.* are not greater than those between individual specimens collected by Mr. Stevens and Mr. Inglis so that I have no hesitation in treating them as one and the same species.

(*To be continued.*)



THE MADRAS AQUARIUM.
Exterior view and ground plan.

THE MADRAS AQUARIUM.

BY

JAMES HORNELL, F.L.S., F.R.A.I.

(*With a plate and 6 text figures.*)

In spite of the fact that the Madras Aquarium was opened so long ago as 1909, and that it has proved a wonderful success whether judged by the public interest aroused or by the cold verdict of finance, it has had no imitators on the Asiatic mainland. Until the last few years its reputation had not travelled beyond the confines of Madras, for till that time no strong effort was made to advertise it and make its attractions widely known. The first enthusiasm aroused by its energetic and versatile creator, Mr. Edgar Thurston, the then Superintendent of the Museum, died down in large part when he retired, which unfortunately coincided with the completion of the building; only when it was transferred to the care of the Department of Fisheries was any systematic effort made to extend its usefulness, and develop its possibilities to the utmost.

To Mr. Thurston is due the credit for the inception of the scheme. As is well known he devoted an important section of his life's work to the investigation of the marine fauna of the Gulf of Mannar; his notes on this subject, all too few, are charmingly written and full of interesting observations of great value to naturalists following in his tracks. The idea of an aquarium, where some of the wonders of the coral reefs that fringe the southern shores of the Madras Presidency might be brought home to the multitudes of Madras, must surely have been born on one of these collecting expeditions. At their best, what are stuffed fishes, dried sponges, corals and crabs, and colourless and shrunken specimens in jars, but faded and unsatisfying mummified remains? To one familiar with the wonderful beauty of form and colour of the life of the shallower depths of our Indian seas, the desire to see these under conditions permitting close observation of habits such as is impossible in the sea itself, is always present; the designing of the Madras Aquarium was the outcome of this feeling in Mr. Thurston's case. Curiously enough, the writer, not then connected with Indian fishery development, happened to be in Madras at the time when the plans were being roughed out, and his remembrance of discussing with Mr. Thurston the details and arrangements of the tanks and fittings is vivid; apart from the interest of the subject, the personality of the designer was an arresting one, for Mr. Thurston had filled many roles in his career.

Funds were not available for a very extensive or elaborate building; simplicity and economy had to be studied, and both architect (Mr. Harris, Consulting Architect to Government) and contractors did wonderfully well to complete the building, virtually as it stands to-day, for the sum of Rs. 17,604; installation of electric lighting and fans subsequently cost an additional Rs. 4,778.

It is located on the sandy sea-beach, opposite the Presidency College, and midway between Fort St. George and San Thomé—between what were the original settlements of the English and the Portuguese at Madras. This long line of beach, bordered by a fine promenade, the 'Marina,' the pride of Madras, has broadened considerably since the construction of the harbour works owing to sand accretion due to the northerly drift of sand along the coast in this locality; it is this accretion that has permitted of the erection of a building on the seaward side of the roadway at the spot chosen as the site for the Aquarium. Principally for æsthetic reasons the design of the building had to be restricted to one floor; that too is sunk some four feet below the general ground level. Originally it was less, but year by year drifting sand continues to raise the ground level; increasing difficulty is experienced in coping with this trouble.

The building was opened to the public on 21st October 1909. It remained for ten years in charge of the Superintendent of the Museum, till in 1919. it was transferred to the Department of Fisheries for the two-fold reason that this Department has particular need for the possession of aquarium facilities for the prosecution of its investigations into the life-histories of the local food-fishes, and because of the greater facilities it has for the renewal of the stock of fish and other animals required for the tanks. The change of management has been fully justified for measures were at once taken to increase the number and variety of the exhibits, to remodel the table aquaria, to instal electric lighting and fans and to make the place and its attractions better known. By introducing electric light, it became possible to keep the aquarium hall open after sunset, and at present the evening has become the most popular time to visit the collection; the brilliant illumination of the tanks shows up the colouring of the fishes to greater advantage than when viewed by daylight; troublesome reflections, caused by bright sunshine pouring in through doors and ventilators are eliminated, and the ideal condition for viewing the inhabitants of the tanks is attained—the view from a darkened hall of the tanks lit from behind by brilliant lights hidden from the observer. By the use of electric bulbs, such flexibility is possible in the lighting arrangements that the illumination of each tank can be studied individually and so lit at the best possible angle.

In the year when the Fisheries Department took charge, the total number of visitors who passed the turnstile was 95,957; after the installation of lights and fans, and the introduction of other improvements the number rose to 163,517. To this success the issue of an illustrated handbook has greatly contributed and has proved the best possible means of advertisement. The first edition of 1,500 copies, priced at the nominal charge of one anna, issued in October 1919, was exhausted within four months. A second edition of 5,000 copies, and considerably enlarged, but still priced at the same low figure was issued in February 1920, and was in turn exhausted by the end of 1921, when a third English edition, again revised and enlarged to 39 pages, was published. This actually costs to produce thrice the price charged but for the sake of its educational value and for the advertisement it affords, Government have sanctioned its continued sale at the original and popular price of the single anna. In addition to the English edition, a Tamil translation has been published but curiously enough the English edition continues to be the favourite with Indian visitors. Two rates of admission to the Aquarium are charged, six pies and four annas, in order to permit the poorest to have an opportunity to visit it and also to allow the better classes to have the advantage of seeing it under less crowded conditions than otherwise would be possible. From 2 to 5-30 p.m. admission is half an anna, at all other hours four annas. On Fridays the charge throughout the day is at the higher rate. On the great Indian festivals when thousands flock to see the wonders of the local sea, a special charge of one anna is made all day. Finally in order that no obstacle may stand in the way of any section of the community visiting it, a gosha day, when ladies only are admitted, is arranged for the last Monday in each month; on these days women attendants are in charge of the building.

The Aquarium Hall is a lofty rectangular room, 35′-6″ in length by 50′-6″ wide. To roof this great width, three ridged spans are employed, supported on four rows of slender ornamental pillars; the outside row along each side, is utilized to carry two heavy brass barrier rails,spaced two feet six inches from the front of the tanks. The two short sides are occupied by ten large aquarium tanks built into the walls. Four small rooms, with the entrance vestibule and turnstiles, form the front side, while a large opening in the middle of the rear wall was provided in the original arrangement to permit of visitors seeing into a deep semicircular open-air pool, intended for such large animals as full-grown sharks and turtles which could not be accommodated in the wall-tanks on account

of their size. Experience has shown this plan to labour under two great disabilities: the great size of the opening, approximately one-third of the entire rear wall space, admitted such an excessive amount of bright sunlight as killed the lighting of the side tanks, while the arrangements did not even permit of the fishes in the tank itself being seen to advantage—partly by reason of the too great depth allowed and partly to reflection of the sky and clouds; in rainy weather the arrangement sometimes led also to the flooding of the floor of the aquarium hall. Accordingly when 'Fisheries' took charge, it was decided to abolish this outside tank, close in the greater part of the opening in the wall and raise the low parapet wall over which visitors used to lean to view the contents of the tank, sufficiently high to accommodate a number of table aquaria. These alterations have proved satisfactory.

In the centre of the hall is an ornamental open freshwater pond sunk in the floor, with a central fountain. Tables carrying small rectangular glass-sided aquaria are disposed about the room wherever they can be conveniently placed, while the two end walls are utilized for the display of typical collections of preserved specimens illustrative of the range of marine animals, dry and in fluid, available in the zoological supply section of the Fisheries Department for educational purposes, such as for dissection in practical zoological studies or for museum display.

The ten large tanks are constructed of masonry. They measure 7 feet in length by 4 feet from back to front, with a depth of 3 feet. The partitions separating them are of Cuddapah slabs (thick slate). Originally the backs of all the tanks were lined with white glazed tiles; this has the great advantage of affording no lodgment for particles of uneaten food and dirt, a consideration of the greatest moment in aquarium management, but it does not satisfy the æsthetic sense and for this reason a rockwork background has been provided in a number of the tanks. Each glass front consists of a plate glass sheet, one inch in thickness, measuring 6′-6″ in length by 3 feet wide. The lower edge and the ends are bedded against a cement-formed ledge in the masonry frame, and after being caulked carefully with putty, an inner ledge of cement is added on the inside of the tank, so forming with the one formed originally on the outside, a deep groove within which the edge of the glass plate is secured. The putty used is a mixture of red lead, white lead and litharge powder amalgamated with boiled linseed oil by means of thorough pounding. In fixing the glass in position, a thick bed of this putty, mingled with oakum to give body, is placed in the half groove on the bottom and the edge of the glass rested on this. The space up each end of the plate is then filled in and only when this is set is the inner ledge of cement placed in position. This latter must not come into contact with the back surface of the glass; a space of $\frac{1}{8}$th inch must be left, to be filled ultimately with the special putty. The upper edge of the glass is held in position by an ornamental wooden cross bar; above this the space between the masonry pillars, between the fronts of neighbouring tanks, is filled in with wooden venetians, with a door in the centre to permit access to the tank in an emergency. The bottom of the tank is three feet from the floor, a height found to be very satisfactory. The higher of the two barrier rails in front of each tank is 3′-6″ from the ground and this, at a distance of 2 feet 6 inches from the glass front of the tank, has also proved to be the correct height.

The method of daylight illumination adopted is from overhead by means of a large square of glass let into the centre of the roof tiling above each tank, the roofing being a continuation of that over one side of the outer span of the aquarium hall. For evening illumination, electric light pendants are employed, 5 or 6 in each tank, with opal glass reflectors. When artificial lighting was first introduced bracket lights were used; these proved unreliable, for the wiring was so subject to wetting and corrosion that short circuiting often occurred

and for this reason pendants were substituted as the wiring of these is far less liable to damage.

The aëration of these tanks is dual, partly by the inflow of filtered sea-water from a high level reservoir, partly by means of an air compressor delivering air in a mist of tiny bubbles at the bottom of each tank. To obtain sufficiently minute division of the air stream, it is delivered under pressure through filter candles hung in the tanks. By this means, the water is kept so fully aërated that it is possible to maintain a permanent state of overcrowding seldom if ever found, even temporarily, in the open sea. Unfortunately it is not possible to regulate this super-aëration to suit the varying constitutional idiosyncrasies of every kind of fish. Some, in consequence, suffer from a disease that has been appropriately called 'gas-eye.' It arises from an excess of air finding its way into the blood stream, by absorption through the gill-membranes; the outward sign of the disease is the partial protrusion of the eye-balls. Many of the fish affected eventually recover,and all do so quickly if transferred to ordinary sea-water. A proportion die either directly from what appears to be a form of asphyxiation, or indirectly from the onslaught of the other fish in the tank, to whom the sight of a protruding eye-ball is the signal for attack; the eye-ball in these cases is often plucked out and if the fish be small, it is often killed outright. The larger ones after losing an eye not infrequently recover and this accounts for the presence of quite a considerable number of the larger fishes in the tanks being short of one eye. The air circulation is effected by means of a manual air compressor which stores up compressed air in two cast iron cylinders, whence an outflow is led through tubing to the various tanks. The table aquaria successfully depend wholly on compressed air aëration, even in the hottest weather.

The water circulation arrangements comprise three underground reservoirs which may be named A, B and C at the rear of the aquarium, a gravel filter bed, and a high level supply tank. A pipe from the sea margin conveys new supplies of sea water when required to the median reservoir A, whence it is pumped by hand into the filter; from there it passes into the underground storage reservoir B used normally for filtered water only. From this supplies are again pumped by a cooly into a high level iron tank, whence the water flows by gravitation, controlled by stop cocks, to the several aquarium tanks. The overflow from these is at the surface, and flows back to storage reservoir C, to be pumped by hand into the filter bed, in order to be freed from impurities before entering again into circulation. Each tank is also provided with a clean-out pipe-exit at the bottom, for use when the tank has to be emptied for any purpose. The piping used is of galvanized iron, the stop cocks being of brass or gun metal. In spite of considerable corrosion, the original piping is still serviceable.

The table tanks are of various types as the first patterns have been greatly improved upon of recent years. The most useful form is one where the base is composed of a single plank of teak (2½ inches thick), carrying four stout upright grooved pillars at the corners, into which the four glass plates forming the sides and ends are let. The grooving is puttied with the same material as in the larger tanks, and as an additional waterproofing precaution, a thick layer of asphaltum is poured hot over the wooden bottom on the inside. An ornamental wooden beading finishes off the upper edge of the tank and supports a protective cover-frame.

The floor tank has not been a success as it has been found impossible to light it satisfactorily. Murrel and Gourami live well in it and the former have bred there several times, the parents watchfully guarding the nest; they resent actively any prying into their domestic affairs on the part of visitors. The four rooms at the front of the building comprise two store rooms, a pump room, where the air compressor is located, and a curator's room. At the rear of the building, an additional laborato has recently been built, as the need for such a convenience

has long been urgently felt. The main hall and the principal side rooms are furnished with electric ceiling fans, an improvement of recent date and one greatly appreciated by visitors particularly on crowded days in the hot weather.

All the fishes exhibited have been obtained in the neighbouring sea, within ten miles from Madras itself. Varied as is the collection, it comprises probably not one-tenth of the species available in these waters. Many among the common edible fishes, such as hilsa, mackerel and various sardines are too delicate to stand handling and transport to the tanks. The local fishermen too are reluctant to bring the better class of edible fishes, as they still entertain a belief that one object of the Aquarium is to breed fishes and they fancy that if this be done, there may be such a glut of fish that they will obtain but poor prices for their catches! Other classes of fishes are unattractive or too bulky to exhibit.

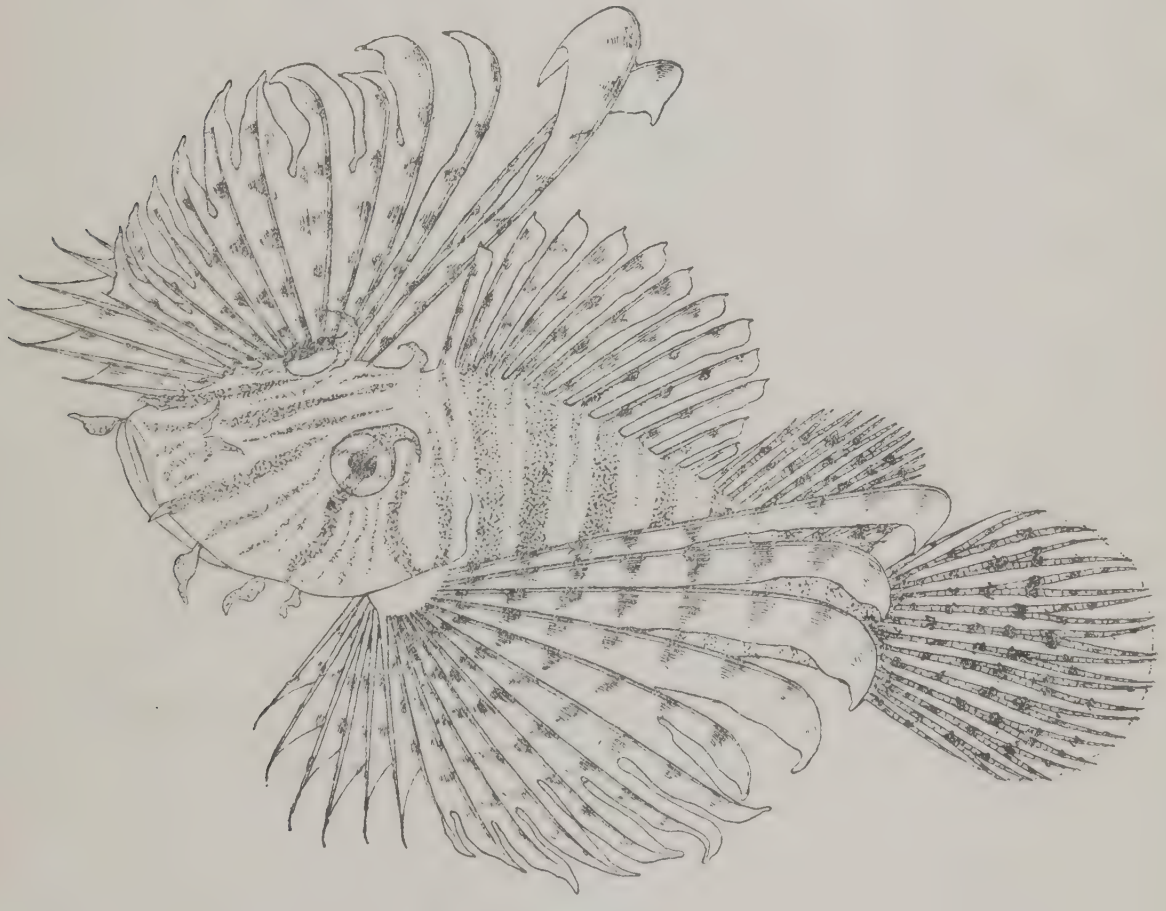


FIG. 1.—The Scorpion Fish (*Pterois russelli*).

Among the most showy fishes are the Scorpion-fish (*Pterois russelli*), the Butterfly-fishes (various species of *Chætodon* and *Holocanthus*) and the Parrot-fishes (*Julis* spp.). The first named are magnificently ornate creatures that compel attention and admiration; the pectoral fins have attained dimensions far beyond anything requisite for swimming and must have some other reason — probably that of warning, for this fish is endowed with virulently poisonous spines in the dorsal fin. This fish's movements are those of a mannequin on show when it swims; it sails along very slowly and gracefully, with a just perceptible fluttering of the great butterfly-like fins; it often halts for moments together

as though asking for admiration and at times will even slowly rotate that one may view it from all points.

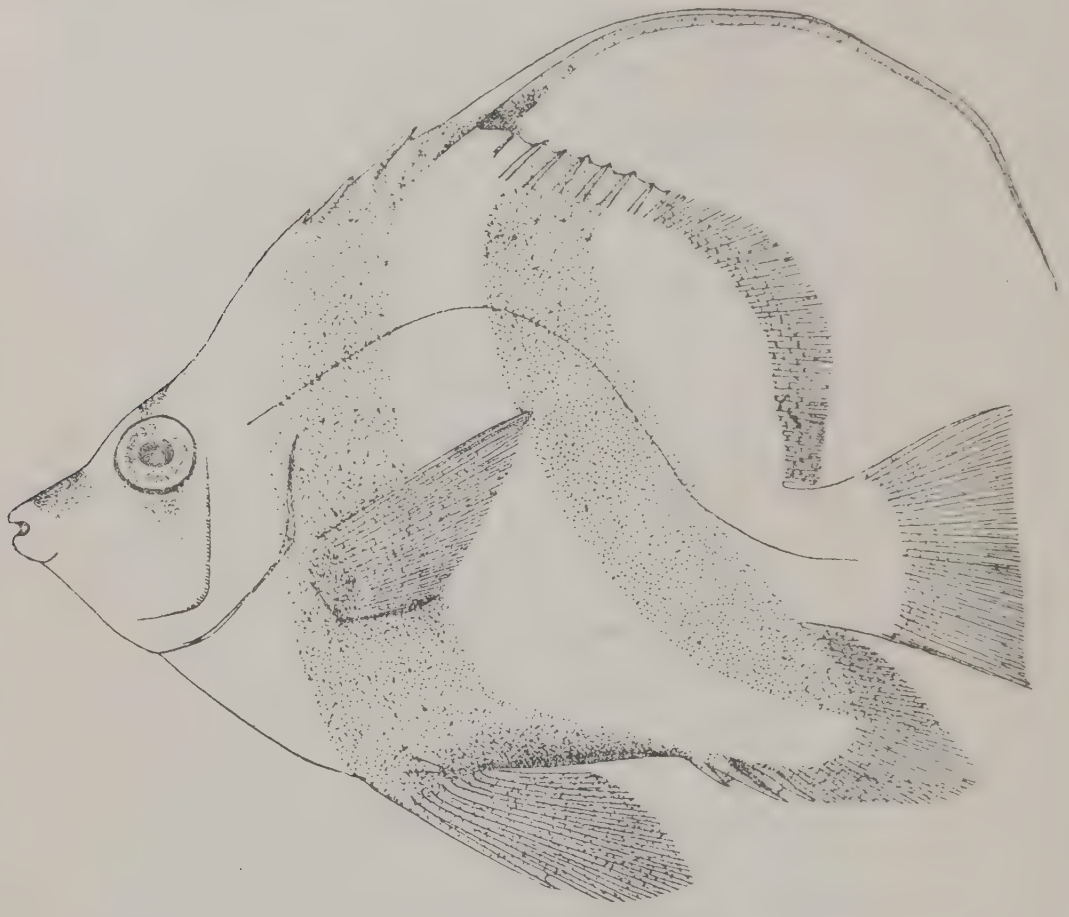


FIG. 2.—Yellow-finned Butterfly-fish (*Heniochus macrolepidotus*).

Another extremely pretty fish is the yellow-finned Butterfly-fish, *Heniochus macrolepidotus*. Its bold black and white vertical banding and yellow fins claim notice and admiration. The dorsal fin carries a long yellow streamer often missing however, as it is too tempting to other fishes, which generally bite it off. Like many other pretty creatures, it is of a vicious nature and is inclined to play the bully towards the wounded or the sick.

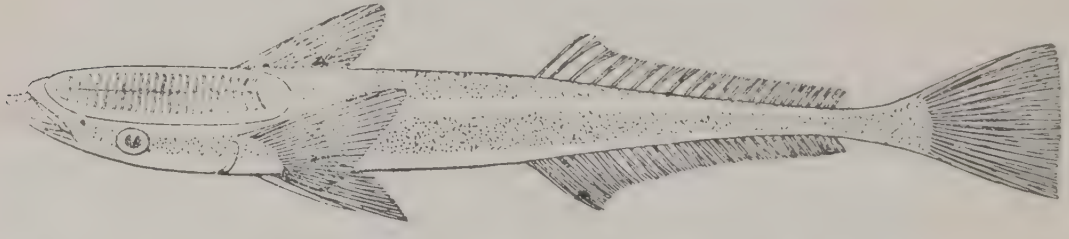


FIG. 3.—The Common Sucker-fish (*Echeneis naucrates*).

Small specimens of the Tiger-shark remarkable for the beauty and intensity of its black and white striping, are usually present in the tanks, living together with such other notable sea-creatures as the Murænid eels and the curious sucker-fishes (*Echeneis naucrates*), often called 'Remora.' These latter are so named from the presence of a long sucker organ on the upper part of the head, made up of a double row of transverse plates set in an oval frame. By

its help these fishes are able to attach to ships, whales and turtles, and so get carried about without effort on their part. In some parts of the world this habit has been utilized by fishermen in the pursuit of turtle, a sucker-fish with one end of a strong cord tied to the tail being set free when a turtle is seen resting on the surface of the sea. The Remora instantly swims to the turtle, as being a suitable object to affix to ; when attached, the fishermen haul in the line and with it both turtle and sucker-fish. Columbus described this custom as practised by the Caribs. Though not now practised in the West Indies, it appears to be in use on the African coast and by the ever ingenious Chinese.

A tank containing a large number of the Rosy-banded Snapper (*Lutianus sebæ*) is very popular, so beautiful are these fishes, banded dark crimson and white. Like so many other fishes these snappers change colour on occasion. When spoiling for a fight or struggling for food their colour bands gain greatly in intensity, fading considerably when resting.

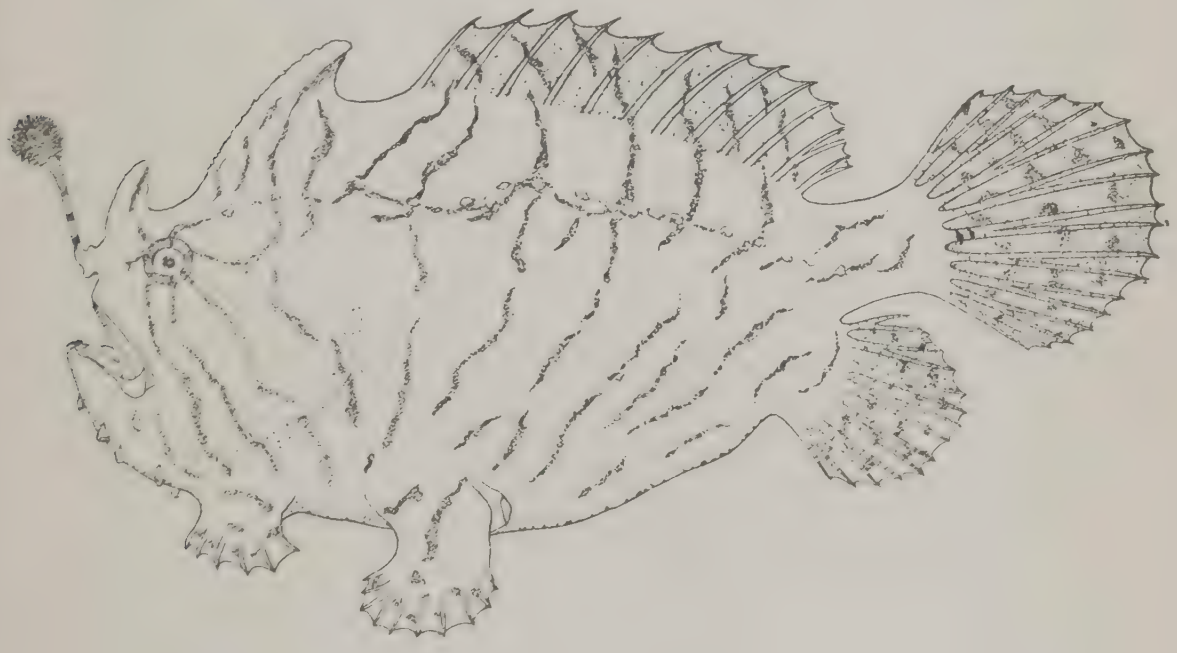


FIG. 4.—The Yellow Angler (*Antennarius hispidus*).

Other noteworthy fishes are the Yellow Anglers, *Antennarius hispidus* and *A. nummifer*. The former is quite common at Madras, and some are always present in the tanks. Like its well-known European relative, *Lophius*, (the Fishing-frog), the first dorsal fin ray is modified into a miniature fishing-rod with a fluffy white tassel at the end to represent the bait. It is a lumpy little fish, yellow in colour with numerous dark stripes, possibly colour markings that subserve a protective function. Its custom is to lie inert and motionless, flicking their tassel-bait nervously to and fro to the end that some inquisitive little fish may be attracted to enquire into what curious thing this may be. If he come close enough, a great gape of mouth opens suddenly and the little fish disappears. The feeding of these fishes always causes absorbed interest on the part of visitors. They are so accustomed to have their prey come to them and literally fall into their mouth that when feeding time comes, their more active tank companions give them no chance to get food. So the attendant has to transfix a morsel of fish on the end of a wire and dangle it above the face of the fish, which generally snaps it up just as the attendant's patience is on the verge of exhaustion.

The File-fishes (*Balistidæ*), the Spinetails (*Acanthurus* spp.) and the Puffers (*Tetrodontidæ*), form other attractive exhibits either because of the beauty of their colouring or the curious form assumed. Small electric rays, (*Narcine indica* and *N. brunnea*), are generally present to give sharp little shocks to visitors bold enough to handle them.

Both the two local Cichlid fishes, *Etroplus suratensis* and *E. maculatus*, remarkable for their adaptability to life either in salt or in fresh-water, are represented in the collection. The former, which may appropriately be termed the Pearl-spot, grows to a marketable size and has an excellent flavour ; it is assuming considerable economic importance in Madras for these reasons in the scheme now being put into force for the restocking of inland tanks with a better class of fish. Both species have peculiar nest-building habits, their eggs being adhesive and deposited on the under side of stones and logs in shallow waters. The Pearl-spot breeds equally well in fresh and brackish water and is altogether a remarkable and valuable species.

FIG. 5.—The Pearl-spot (*Etroplus suratensis*).

Quite a number of the fishes have lived for many years in the aquarium tanks, notably several sea-perches of the genus *Serranus*. Three of these have lived in the aquarium between 10 and 11 years, having been brought in quite small, soon after the building was opened. Their growth has been considerable and now they must weigh from 20 to 25 lbs. each. They furnish living evidence of the healthy conditions prevailing in the tanks for their condition is perfect and any injuries received when fighting—they snap viciously at each other on occasion—heal rapidly and completely.

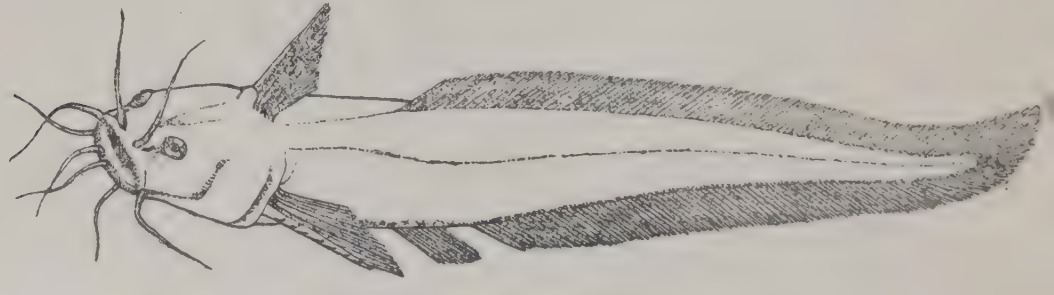


FIG. 6.—A common Cat-fish (*Plotosus canius*).

Another old resident is a very large Cat-fish, *Plotosus canius*, that has a great attraction for visitors because of his superlative ugliness. An allied genus, *Arius*, is also often shown in the tanks and is perhaps even uglier than *Plotosus*; a point of interest in certain species of *Arius* is that the male has the curious habit of receiving the eggs, as extruded by the female, into his mouth where he retains them till the young hatch out. As the eggs are particularly large, about half an inch in diameter, the number that he can care for is limited. The eggs completely fill his mouth, so the poor father has to abstain from feeding till his family is born, and able to swim away.

Of fresh-water fishes, the nest-building murrel and gourami find a home in the central floor pool, while a table tank accommodates examples of the curious climbing perch *Anabas scandens*, called in Tamil by a descriptive name that translates into "the Perch that climbs Palmyra palms"; in another are shown scores of the little fishes *Haplochilus melanostigma* and *Panchax parvus*, that are now being bred in thousands by the Fisheries Department for the purpose of destroying mosquito larvæ in ponds and pools. These are supplied at low rates to public bodies interested in combating the malaria scourge; when properly cared for, these fishes thrive and multiply prodigiously and subserve this mosquito-larvæ destroying purpose admirably.

One tank is given up to various species of sea-snakes abundant in the sea off Madras. This exhibit has very great attraction for visitors, who look with awe on these super-poisonous creatures, possessing venom several times more deadly than that of the cobra. Actually they are most inoffensive creatures, except towards fish on which they prey, or in the rare case of being trodden on by some incautious foot. The attendants do not fear them nearly so much as they fear the pretty harmless-looking *Pterois russelli*. And there are always a few small sea-perches in the same tank that unconcernedly snatch fragments of meat from amid the writhing coils of these snakes at feeding time.

Little accommodation is available for other exhibits than fishes, but usually some of the more curious crustaceans and molluscs of the district are represented. Among the former are the spiny Crawfish (*Panulirus*), various swimming crabs such as the blue-limbed *Neptunus pelagicus*, the three spotted *N. sanguinolentus*, and the strange little *Dorippe dorsipes*, camouflaging itself by holding a bivalve shell over its back with the aid of the two last pairs of legs that have been modified specifically for this purpose. Of Molluscs, examples of the Sacred Conch, *Turbinella pirum*, and various spiny Murices are often present, together with small examples of the Octopus of a species caught in thousands by the fishermen of Palk Bay in curious shell traps, tied in large numbers on long lines laid in shallow water.

NEW AND LITTLE KNOWN INDIAN BOMBYLIIDÆ

BY

LIEUT.-COLONEL C. G. NURSE.

(With a plate.)

The publication of Brunetti's Vol. I, Diptera Brachycera of the Fauna of British India series has stimulated me to attempt the determination of some of the Diptera I had collected while in India. My entomological energies during the last part of my Indian service were devoted chiefly to Hymenoptera, but I carefully preserved any conspicuous Diptera that I came across, and thus amassed a fair amount of material. Having recently come to reside in London in close proximity to the Natural History Museum, I have had opportunities of comparing my specimens with those in the national collection, and of access to the unrivalled library of the Museum. In working through the *Bombyliidæ* I found that I had taken representatives of several genera which had not previously been recorded from India, and a considerable number of species which are either undescribed, or have only been recorded from outside Indian limits. I therefore decided to publish the result of my studies.

I have to acknowledge the kind help of Major E. E. Austen, D.S.O., who has not only given me the benefit of his opinion from time to time, but has also placed at my disposal his private copies of several pamphlets dealing with the *Bombyliidæ*.

The present paper covers only the genera *Litorrhynchus* and *Exoprosopa*, but I hope later on to work through the other genera of *Bombyliidæ* as represented in India.

Litorrhynchus, Macq.

This genus, of which the original spelling was *Litorynchus*, was erected in 1840 by Macquart to include certain species of *Exoprosopa* which have a more or less rounded face, long proboscis, and peculiar wing pattern. Most subsequent authors, including Brunetti in Vol. I, Diptera Brachycera, have sunk it as a synonym of *Exoprosopa*. I follow Professor Bezzi (Tr. Ent. Soc., 1911, p. 629) in keeping the two genera distinct, although one or two of what he regards as the essential characters of the genus do not quite apply to the only two species known from India. In these the proboscis, though considerably longer than the head, is not twice as long, and the style is somewhat shorter than the 3rd antennal joint.

The two Indian species may be distinguished as follows :—

Sides of 1st abdominal segment with white hairs .. .. *lar*, Fab.

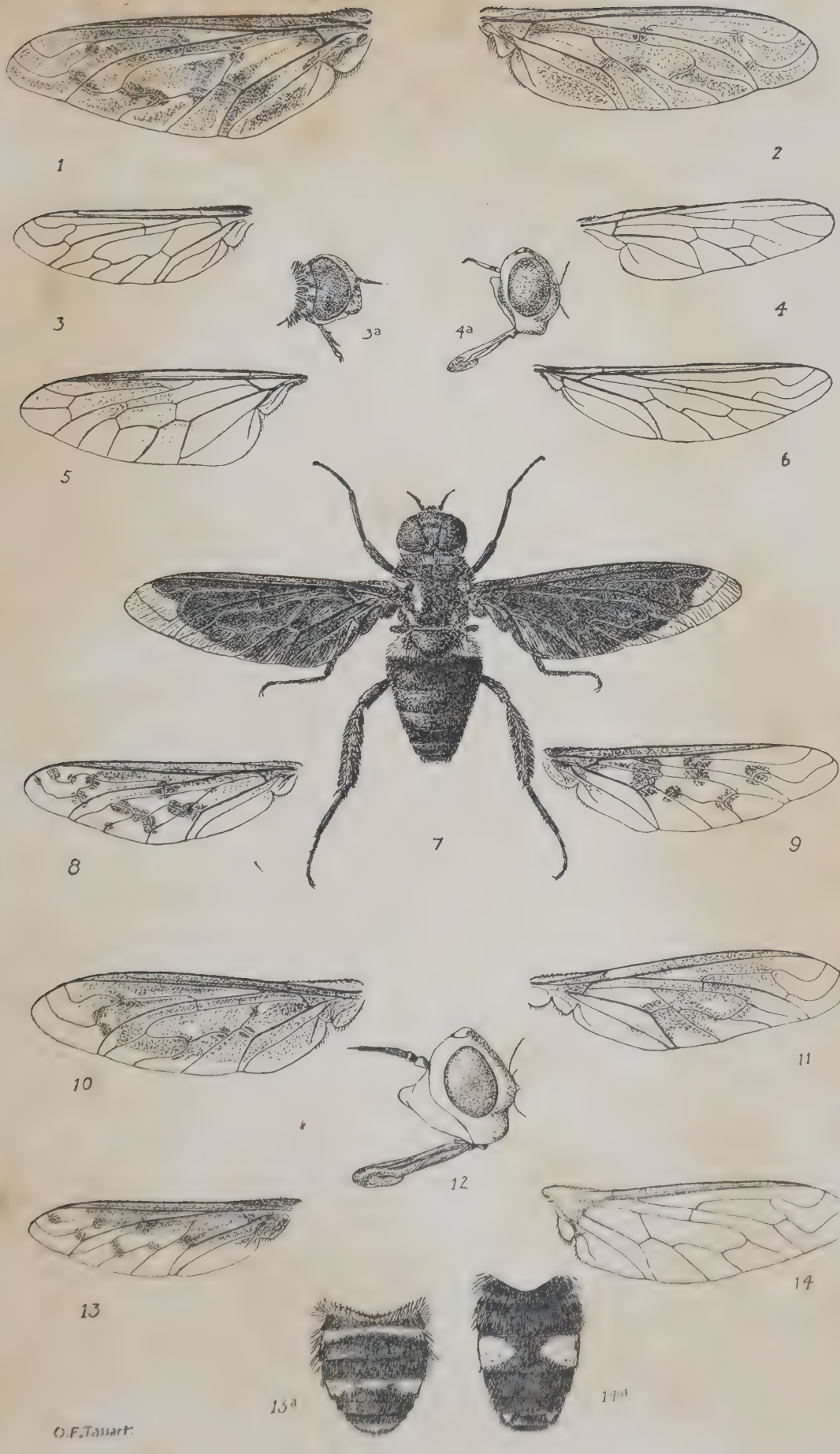
Sides of 1st abdominal segment with black hairs .. .. *collaris*, Wied.

Brunetti sinks *collaris* as a synonym of *lar*, but I hold very strongly that they are quite distinct. The wing band in *collaris* is darker than in *lar*, and its outer border less rugged. The ground colour of the abdomen in *collaris* is black and in *lar* rufous or rufescent. In *lar* there are white hairs near the apex of abdomen, but these are absent in *collaris*. These differences are not sexual, as I have both sexes of *collaris*.

Both species appear to be widely spread in India ; Brunetti records them from various localities, and I found both at Deesa and Jubbulpore. The pubescence on the abdomen of most of my specimens of *collaris* is not at all rubbed, and the hair at the sides of the 1st abdominal segment is pure black, though there are a few white hairs on the thorax below the postalar calli.

The figure of the wing (fig. 3, plate III) given in Vol. I, Diptera Brachycera, agrees better with *collaris* than with *lar*.

The two specimens now in the British Museum mentioned by Brunetti on p. 196 as having been obtained by Col. Yerbury in Ceylon, belong to two different species, and should probably be assigned to *Exoprosopa* rather than to the



SOME INDIAN BOMBYLIIDÆ.

present genus. The one labelled "? *binotata* Macq." does not agree with Macquart's description of that species.

Exoprosopa, Macq.

This is a very rich and rather heterogeneous genus, as Professor Bezzi remarks in Tr. Ent. Soc., 1911, p. 635. It will probably be split up eventually, and some of the species at present included in it will have to go elsewhere. In working out my specimens I was much puzzled by a species that occurs at Mount Abu, which has the neuration of *Exoprosopa*, but the wing pattern of *Thyridanthrax*. Looking over some insects which had recently been returned to the British Museum by Professor Bezzi, I found that he had described it as a *Thyridanthrax* from Africa, where it is widely spread. I also note that he now places Loew's *Exoprosopa lota* in *Thyridanthrax*, although he recorded it as an *Exoprosopa* in Tr. Ent. Soc., 1911, p. 645.

When the Indian dipterous fauna becomes better known, the number of species of *Exoprosopa* that occur in that country will certainly be increased by numerous additions. There are, both in the British Museum and in my own collection, a number of specimens which undoubtedly belong to undescribed species, but in most cases they are in indifferent condition, and to describe new species from examples more or less denuded of their pubescence is only to increase the difficulties of future students of Diptera. As regards the generic characters Brunetti makes a slight slip on p. 189 of Vol. I. His statement "all tibiæ without spinules" should read "fore tibiæ without spinules," as most of the species, if not all, have spinules on the intermediate and posterior tibiæ.

The following key to the species recorded from India is based as far as possible on Brunetti's table of species on pp. 190-192 of his work. It must not be taken as dividing them according to their affinities, but it ought to assist a collector to name his specimens, unless he obtains anything new to India. In preparing the key I have relied on Brunetti's descriptions as regards the following species —*flavipennis*, *duplata*, *puerula*, *annandalei*, *brahma*, and *nitrea*. All the other species are represented either in the British Museum or in my own collection.

Key to the Indian Species of EXOPROSOPA.

1.	1st posterior cell closed	2
	Do. open	9
2.	Wings bright yellow at base	3
	Wings not bright yellow at base	5
3.	Wings with two brown bands	*flammea*, Brun.
	Wings with only one brown band	4
4.	Abdomen with the ground colour black	*flavipennis*, Brun.
	Do. do. red	*tamerlan*, Portschinsky.
5.	1st posterior cell long stalked	6
	Do. short stalked or closed on the margin	7
6.	4th longitudinal vein interstitial with cross vein connecting 3rd and 2nd longitudinal veins ..	*interstitialis*, n. sp.
	4th longitudinal vein not interstitial	*fusconotata*, Beck.
7.	Wings very dark brown at base	*siva*, n. sp.
	Wings not dark brown at base	8
8.	Apex of wings hyaline	*albida*, Walk.
	Do. more or less infuscated	**abjecta*, n. sp.
9.	Wings wholly black or blackish	*latipennis*, Brun.
	Wings not wholly black or blackish	10

* This species sometimes has the 1st posterior cell open, and therefore appears again below.

10. Hind tibiæ with long and dense scales 11
Do. without long and dense scales 12
11. Sides of 1st abdominal segment with black hairs .. *pennipes*, Wied.
Do. do. white hairs .. *pennata*, n. sp.
12. 1st posterior cell with an additional transverse vein in its centre .. .. .. *evanescens*, Beck.
Do. without an additional transverse vein in its centre 13
13. 2nd posterior cell twice as wide at base as at tip .. 14
Do. as wide at tip as at base or wider 15
14. Larger ; 14-18 mm. ; sides of abdomen with black hairs .. .. *lateralis*, Brun.
Smaller ; 8-12 mm. ; sides of abdomen without black hairs .. .. *gujaratica*, n. sp.
15. Baso-anterior half of wing considerably darker than the remainder 16
Basi-anterior half of wing not or scarcely darker than the remainder 21
16. Dorsum of abdomen with white scale-spots .. 17
Do. without white scale-spots .. 18
17. Larger ; 14 mm. ; antennal style normal .. .. *maculiventris*, Brun.
Smaller ; 8 mm. ; antennal style as long as 3rd joint *stylata*, Brun.
18. Clear part of wing without isolated dark spots .. *puerala*, Brun.
Do. with isolated dark spots 19
19. Abdominal ground colour, black or blackish .. *insulata*, Walk.
Abdominal ground colour, red or brown 20
20. Baso-costal band flavous .. .. *abrogata*, n. sp.
Do. not flavous.. .. .. { *alexon*, Walk. / *annandalei*, Brun.
21. Wings more or less infuscated, though there is no distinct baso-costal band 22
Wings almost clear, though the marginal cell may be darkened 24
22. Tip of wings hyaline .. .. *dissoluta*, n. sp.
Do. not hyaline 23
23. Wings mainly tawny .. .. *auriplura*, Walk.
Wings not at all tawny .. .. *abjecta*, n. sp.
24. Thorax and abdomen with iridescent blue scales .. *iridipennis*, n. sp.
Do. white or grey scales .. 25
25. Cross veins more or less suffused 26
Do. quite clear 27
26. Scutellum and antennæ, black .. .. .. *bengalensis*, Macq.
Do. reddish yellow or brown .. *brahma*, Schin.
27. Antennæ wholly black 28
Some joints of antennæ red or ferruginous 30
28. Larger ; 15 mm. or more .. .. *niveiventris*, Brun.
Smaller ; 13 mm. or less 29
29. Thorax and abdomen with bright yellow hairs .. *vitrea*, Brun.
Do. without bright yellow hairs .. *punjabensis*, n. sp.
30. Antennæ entirely brownish yellow .. .. .. *vitreipennis*, Brun.
Do. only ferruginous at base .. .. .. *basifascia*, Walk.

(In order to assist entomologists working in India, I have given below abbreviated descriptions of any species now recorded from Indian limits which have already been described, but which are not included is Vol. I of Diptera Brachycera.

Exoprosopa tamerlan, Portschinsky.

Horæ Soc. Entom. Ross, Vol. XXI, p. 185.

♂♀ Head, including antennæ, thorax, and abdomen mainly or entirely red, covered with rufous scales and rather sparse pubescence of similar colour; 3rd abdominal segment bears a small spot of white scales on each side, but this is often obsolete or abraded: legs mainly black, wings with a broad yellow bases costal band, margined posteriorly by a brown band, the latter varying considerably in width and intensity, apical and posterior margin hyaline; 1st posterior cell closed, the 4th vein meeting the 3rd nearly half way between the fork of the latter and the wing border.

Length 18-21 mm.

This fine species is common at Quetta, where I obtained nine specimens which agree well with Portschinsky's description, and also with the figure given in Becker's Persische Dipteren.

Originally described from Merv, and Becker records it from Persian Baluchistan.

Exoprosopa interstitialis, n. sp.

♂. Head; frons at level of antennæ rather more than one-third the width of head, not much narrowed at vertex; upper mouth edge protruding, viewed in profile fully half the short diameter of the eye; vertex black, with short stiff black hairs which extend nearly to the antennæ, frons and face yellowish, covered with yellowish grey scales, below which a black spot is visible just above the upper mouth edge; lower mouth edge very pale testaceous; antennæ brownish black, 1st and 2nd joints with stiff black hairs, 3rd joint, excluding style, as long as the first two combined, gradually tapering, with style $\frac{2}{5}$ of its length; proboscis rather long, blackish, palpi dark brown; occiput blackish, with a fringe of white scales along eye margins.

Thorax black, with a collar of pale yellowish grey scaly hairs, extending back towards the wing bases; disc covered with yellowish grey scales, bristles at base of wings and on postalar calli pale yellow; mesopleuræ with grey pubescence, scutellun reddish brown, with scales similar to those on the thorax; marginal bristles pale.

Abdomen mainly brick red, but all the segments are more or less black at base; disc with grey scales (partially denuded), and with a few short stiff hairs on apical margins of segments, especially towards the sides, which are thickly covered with greyish scaly hairs; venter red, covered with grey scaly hairs.

Legs chiefly red; coxæ with long grey pubescence, femora and tibiæ covered with grey scales, tarsi brownish, becoming nearly black towards apex; intermediate and posterior tibiæ with black spinules.

Wings dark brown, with a flavous tinge at base to beyond humeral cross vein; there is a very ill-defined oblique median darker band, and there are dark suffusions on all the cross veins, but the following portions of the wing are sub-hyaline, *viz.*, the greater portion of 2nd basal cell, base of anal cell, apical half of discal cell, and most of the marginal and posterior cells; in the apical fourth of wing the discs of the cells are darker than in the immediate vicinity of the longitudinal veins; the first posterior cell is closed and long stalked, the 4th longitudinal vein joining the 3rd at a right angle, and being interstitial with the cross vein connecting 3rd longitudinal vein with the lower branch of the 2nd; most of the larger longitudinal nervures are reddish brown, the smaller ones appearing darker; base of costa with numerous but very short bristles, and some golden yellow scales; halteres pale yellow, fringe of alulæ smoky.

Length 15 mm.

Described from a single specimen taken at Quetta in May. I cannot find among published descriptions any species which combines wing markings as described above with a closed 1st posterior cell.

Exoprosopa fusconotata, Becker.

Persische Dipteren., Ann. Mus. Zool. St. Petersburg, 1912, p. 566.

Head yellow or yellowish, antennæ black ; thorax and scutellum blackish brown, with yellow and white scales and yellow bristles. Abdomen blackish brown, with white interrupted bands on the first four segments. Legs black ; wings greyish, marginal cell yellowish brown ; a brown suffusion at the posterior corner of discal cell ; 1st posterior cell closed at a right angle, and stalked.

Length 10½ mm.

The four specimens taken at Quetta agree well with Becker's description.

Exoprosopa siva, n. sp.

♂ ♀ Head ; frons at level of antennæ one-third the width of head, at vertex about one-sixth in both sexes; black, covered with pale golden yellow scales and black hairs, which are longest on the frons; occiput with short whitish pubescence : antennæ black, 3rd joint rather short, being not much longer than the style : 1st and 2nd joints with black hairs, 3rd bare ; proboscis nearly twice as long as head.

Thorax black ; pronotum and sides with rather long pale yellowish hairs, dorsum with pale golden scales, bristles at base of wings and on postalar calli black ; underside of thorax black with black hairs ; scutellum black, with pale golden scales and black bristles, some of the latter being very long.

Abdomen black ; 1st segment with pale yellow hairs, 2nd with a narrow basal band of similarly coloured scales, 4th and 7th segments with broad basal bands of pure white scales ; venter black, sparsely clothed with greyish hairs and some yellow scales.

Legs entirely black, with some pale scales on femora and tibiæ.

Wings brownish grey, with an oblique blackish baso-costal band reaching the tip of the 1st longitudinal vein, leaving the outer and posterior margins, including most of the anal and axillary cells, clear ; on the clearer portion are the following blackish spots or suffusions, *viz.*, a spot near apex of upper branch of 3rd longitudinal vein, one at the fork of this vein, and one on the cross vein which joins the 3rd and 4th longitudinal veins, one at the apex of discal cell, extending into 2nd posterior cell, one smaller spot at lower margin of discal cell where it is joined by 5th longitudinal vein. The 1st posterior cell is closed a short distance before the margin.

Length 7-10 mm.

Described from four good specimens from Matheran. There is a similar specimen in the British Museum from Mahapur.

This species is quite distinct from *insulata* Walk, to which it bears a superficial resemblance (see remarks on that species below). It differs as follows ; the wings are somewhat shorter, and the 1st posterior cell is closed, whereas it is open in *insulata*. The latter species has apical bands of yellowish scales on the 3rd and following segments, that on 4th being the most conspicuous, whereas *siva* has broad basal bands of snow-white scales on 4th and 7th segments. The oblique basocostal band is narrower in *siva*, and the spots are smaller and differently placed.

Exoprosopa albida, Walker.

Five specimens from Deesa agree with the type and description of this species. The shape of the 1st posterior cell is evidently variable ; in the type it is closed and stalked ; one of my specimens agrees with the type, but in the others it is closed just on or near the margin. It varies considerably in size, my largest specimen measuring 16 mm., and the smallest 11 mm. This species is very doubtfully distinct from *E. bagdadensis* Wied, which Becker records from Persian Baluchistan. The latter has the first two antennal joints testaceous, whereas in *albida* the basal joint only is of this colour.

Exoprosopa abjecta, n. sp.

♂ ♀. Head ; frons at level of antennæ about $\frac{2}{5}$ the width of head, at vertex rather more than half as wide as at antennæ; blackish at vertex, reddish towards antennæ, becoming paler near mouth edge ; facial bump viewed in profile about $\frac{2}{3}$ the short diameter of the eye ; frons and face thickly covered with greyish white scaly hairs, which are longer near antennæ ; antennæ dark red, 3rd joint more or less darkened, gradually tapering, rather longer than the 1st and 2nd joints taken together ; style about half the length of 3rd joint ; 1st joint with thick greyish hairs, 2nd with short black bristly ones.

Thorax blackish, covered with grey scales ; pronotum with a collar of very pale yellowish hairs ; thorax below and at the sides with rather long grey hairs ; scutellum dark red, with grey scales; base of wings, postalar calli, and scutellum with long yellow bristles.

Abdomen both above and below covered with short greyish scales ; 2nd segment above with a transverse apical band of dark brown scales, and 3rd segment with indications of a similar band ; the ground colour of the abdomen is black, but the sides and apical margins of all the segments are red.

Legs red, tarsi blackish ; femora and tibiæ more or less covered with grey scales, and with short black spinules on intermediate and hind legs.

Wings light brown, darker at extreme base ; an ill-defined oblique darker band runs from the middle of the anterior margin to the anal cell ; the apical portion of the 4th longitudinal vein is strongly curved, the 1st posterior cell being either just open or closed on the margin (in one specimen closed and short stalked) ; all the cross veins have darker suffusions ; in the apical portion of wing the longitudinal veins are lighter margined, leaving the middle of the cells darker ; the 2nd posterior cell is slightly wider at apex than at base ; base of costa with yellowish grey scales, mixed with short black bristles ; halteres yellowish white.

Length 9-12 mm.

Described from eight specimens obtained at Deesa in March and April.

The oblique median wing band varies considerably in intensity ; in some specimens it is very noticeable, while in others it is scarcely darker than the rest of the wing. The ground colour of the abdomen varies from mainly red to mainly black. There appears to be little or no difference in the width of frons in the sexes.

Exoprosopa pennata, n. sp.

♂. Head with frons at antennæ about $\frac{1}{3}$ the width of head, at vertex about $\frac{1}{3}$ as wide as at antennæ ; frons black; with short stiff black hairs and traces of white scales; face black, covered with similar black hairs and a few white scales near eye-margins ; antennæ with 1st joint dark red, with stiff black hairs, 2nd joint black, 3rd dark red, blackish at base, gradually tapering, with similarly coloured style, which is about $\frac{1}{3}$ the length of joint; proboscis and palpi black at base, becoming reddish at apex ; occiput with whitish scales near eye-margins.

Thorax black ; pronotum with a collar of greyish black hairs, dorsum covered with iridescent blue scales; a patch of snow-white scales near base of wings, the remainder of sides with stiff black hairs, mixed with a few grey ones; a few short black bristles near wing-base, and similar longer ones on postalar calli ; scutellum black, with traces of blue scales, and black marginal bristles. Abdomen black, covered with iridescent blue scales ; 1st segment with a conspicuous patch of snow-white scaly hairs on each side ; sides of the remaining segments with shorter and stiffer black hairs ; venter with the basal white patches on 1st segment extended below, and traces of white scales on segments 2-5.

Legs black, fore tibiæ and tarsi rufescent, intermediate tibiæ with several rows of moderately long spinules; a patch of white scaly hairs on posterior coxæ; the posterior femora at tip and the whole of the posterior tibiæ covered with long and dense brownish black scales.

Wings blackish brown, hyaline at tip and along posterior margin, the pale portion of wings limited by the tip of 2nd longitudinal vein and not quite reaching the apex of anal cell ; 1st posterior and anal cells open ; alula with a fringe of whitish scales ; halteres brownish.

♀ Similar ; frons a little wider.

Length 16-18 mm.

Described from 4 specimens in good condition from Quetta.

Nearest to *E. pennipes* Wied, from which it differs in the antennæ being mainly dark red, the patches of snow-white scales at sides of 1st abdominal segment, and the more extended clear portion of the wing margin. The dark portion of the wing has in the present species a more brownish tinge than in *pennipes* ; in one of my specimens there are somewhat lighter portions in the 2nd basal, discal, and anal cells.

The specimen from Karachi mentioned by Brunetti on p. 198 of Vol. I, Diptera Brachycera, evidently belongs to this species.

Exoprosopa evanescens, Becker.

Persische Dipteren, Ann. Mus. Zool. St. Petersburg, 1912, p. 559.

I have eight specimens from Quetta which exactly correspond with Becker's description.

Head, including 1st two antennal joints, scutellum, apical portions of all abdominal segments, coxæ, femora, and tibiæ, red ; 3rd antennal joint, dorsum of thorax, bases of abdominal segments, and tarsi, black or blackish. Head and thorax covered with pale yellow scales, abdomen with grey scales. Wings lightly infuscated, apical and posterior margins nearly clear, all cross veins darkened ; the 1st posterior cell is crossed near its centre by a transverse vein (" mit einer überzähligen Querader "). The latter character is uncommon in the genus *Exoprosopa*, though it occurs in *E. singularis* Macq., and a few other species.

In Becker's type the 3rd antennal joint was broken off ; all my specimens have this joint black, rather long and slender, with the style, which is about $\frac{1}{3}$ the length of joint, testaceous.

Exoprosopa gujaratica, n. sp.

♂ Head dull red, with short greyish pubescence, intermixed on frons with short, stiff, black hairs ; frons at vertex about $\frac{1}{6}$ the width of head, at antennæ about $\frac{1}{3}$; proboscis black ; 1st antennal joint yellow, hairy ; second black at base, with apex yellow ; 3rd black on blackish, style thick, about $\frac{1}{2}$ the length of 3rd joint.

Thorax black above, rufescent below, with short but thick greyish-yellow pubescence ; pronotum and sides with longer light yellow hairs ; bristles near base of wings and on postalar calli black ; scutellum reddish brown towards apex covered with pubescence similar to that on thorax, with black marginal bristles.

Abdomen broadly blackish above, but red at sides and on apices of segments, pubescence concolorous with that on thorax, no black hairs at sides or at apex.

Legs red; coxæ, tips of fore femora and tibiæ darkened, all tarsi black ; femora and tibiæ sparsely covered with greyish scales ; intermediate tibiæ and posterior femora and tibiæ with the usual spinules.

Wings rather dark brown, with a narrow border, lighter but not hyaline, extending from the point where 1st longitudinal vein joins the costa rather irregularly to the anal margin ; halteres yellow.

♀ Similar ; vertex slightly broader.

Length 8-12 mm.

Described from six ♂♂ and 2 ♀♀ from Deesa, all taken in October.

This species is nearest to *E. lateralis* Brun, from which it differs in its smaller size, the absence of any black hairs on abdomen, and the extent of the lighter margin of the wings. In the present species the lighter portion is much narrower than in *lateralis*, and less well defined ; there is no lighter indentation running into

discal cell. A series of both species seen side by side appear quite distinct. I have *lateralis* from Mount Abu and Matheran, but did not obtain it at Deesa.

Exoprosopa insulata, Walk.

There are several Indian species with wing markings somewhat similar to *insulata*, Walk., and I found four distinct species standing over that name in the British Museum *viz.*,

(*a*) *insulata* ; two specimens, including the type, from "East Indies"—also a specimen from Assam.

(*b*) a specimen from Dehra Dun, not good enough to describe. It has a pure white band at the base of 4th abdominal segment, and the 1st posterior cell just open.

(*c*) Two specimens from Ceylon (Col. Yerbury), not in good condition. These have the 1st posterior cell closed.

(*d*) A specimen from Madhapur, with the 1st posterior cell closed. This agrees with my specimens from Matheran, which I have described above as *Exoprosopa siva*.

Brunetti probably had two or more species before him when he wrote the description of *insulata* on pp. 203-5 of Vol. I, Diptera Brachycera, though the figure of the wing on Plate III corresponds well with Walker's type, and with my specimens. I therefore give below the points in which his description differs from the type.

The proboscis does not project beyond the tip of antennæ, but just beyond the upper mouth edge, (in my *E. siva* the proboscis projects well beyond the tip of antennæ). I should describe the abdomen as follows :—

Ground colour black, covered mainly with black scales ; 1st segment with a band of rather long yellowish brown erect hairs, 2nd segment with a complete basal band of pale yellow scales, 3rd and following segments with apical bands of similar but rather lighter scales, those on the 3rd and 4th segments the most conspicuous and extending over the side margins, on the other segments these bands are narrower and sometimes hardly noticeable ; the whole of the dorsal surface of abdomen thinly covered with fine long black sinuous hairs ; venter blackish, with black hairs, except on the 1st segment where the yellowish hairs extend well over the sides.

The wings have the dark colouring extending over the basal half of the discal cell, and the basal $\frac{2}{3}$ of the anal and axillary cells, and the spots are situated as follows :—One at the bifurcation of 2nd vein, being merely an extension of the baso-costal band ; one right across the vein closing the apex of discal cell, connected anteriorly with the dark portion of the wing ; free dark spots as follows : two larger ones, one near apex of upper branch of 2nd longitudinal vein, and one over cross vein connecting lower branch of same vein with 3rd longitudinal ; two smaller spots towards apex of lower branch of 2nd longitudinal vein, and one each near apex of 3rd, 4th, 5th and 6th veins, some of the latter being very faint ; both the 1st posterior and anal cells are widely open ; the discal cell is broad at apex, and has a small appendicular vein from its lower corner ; the lower vein of 2nd posterior cell meets the discal cross vein just below the middle, and has a slight appendix into discal cell ; halteres yellowish, base of the club dark.

I have nine specimens, including both sexes, from Simla, which exactly agree with Walker's type.

E. bengalensis is quite distinct, but I have not seen a specimen of *brahma*.

Exoprosopa abrogata, n. sp.

♂. Head ; frons at level of antennæ $\frac{1}{3}$ the width of head, at vertex about half this width ; face and frons rufo-testaceous, covered with yellowish white scales, with a few short blackish hairs ; antennæ red, 1st and 2nd joints with a few black hairs, 3rd joint rather short, gradually tapering, excluding style about $1\frac{1}{2}$

times as long as 1st and 2nd together, style about $\frac{2}{3}$ the length of the joint, thicker at apex than at base ; facial bump rather prominent, viewed in profile about $\frac{2}{3}$ the short diameter of the eye ; proboscis rufo-testaceous ; occiput rather wide, covered with greyish scales, the ground colour immediately behind the eyes darker than the posterior margin.

Thorax blackish on disc, covered with greyish scales ; pronotum with a collar of light yellow hairs ; scutellum dark red ; bristles on postalar calli and scutellum yellowish. Abdomen both above and below light red, the segments more or less blackish at base, covered with grey scales (partially denuded) ; 1st segment with a tuft of light yellow hairs at each side.

Legs rufo-testaceous, with some indications of grey scales on femora and tibiæ ; all femora and tibiæ with very short black spinules ; apical 2 or 3 joints of tarsi darkened.

Wings with the anterior portion as far as the end of 1st longitudinal vein tawny yellow ; all cross veins and the apex of discal cell with dark tawny suffusions, and there are similar but smaller suffusions near the apex of both branches of the 2nd longitudinal vein ; 1st posterior and anal cells open. The third posterior cell is divided by a veinlet which runs towards the apex of discal cell (both my specimens are alike in this respect, but it may be adventitious); base of costa with greyish scales and short black bristly hairs ; halteres yellowish white.

Length 8 mm.

Described from two specimens obtained at Deesa in February.

Nearest to *auriplura*, Walk., but differs as follows : smaller, antennæ red, not black, 3rd joint much shorter than in *auriplura*. In the latter species the whole of the wings are tawny yellow ; in the present species the apical and posterior margins are, except for the suffusions on the veins, almost hyaline.

Exoprosopa dissoluta, n. sp.

♀. Head ; frons at level of antennæ about $\frac{2}{5}$ the width of head, narrowing at vertex to $\frac{3}{5}$ the width at antennæ ; face slightly convex, viewed in profile the upper mouth edge extends beyond the eye margin about half the short diameter of the eye ; vertex and frons reddish brown, becoming paler towards antennæ, below which the whole face and mouth edge is pale testaceous ; frons with some short stiff black hairs, and covered with pale yellow scales, which extend to the mouth edge ; antennæ with 1st joint red, with numerous short stiff black hairs, 2nd and 3rd joints brown or blackish, 3rd gradually tapering, longer than the 1st and 2nd together, style short ; proboscis black, palpi pale ; occiput rather broad, black with some pale yellow scales, the indentation of the eyes with white scales; occipital fringe short, whitish.

Thorax black, with portions of metapleuræ and sternopleuræ red ; pronotum with a collar of pale yellowish scale like hairs ; disc covered with short yellowish scales, among which are mixed a few short stiff black hairs ; patches of greyish white scale-like hairs above and below bases of wings ; bristles near wing base and on postalar calli black ; scutellum dark red, covered with scales like the thorax, and with black marginal bristles.

Abdomen black, apical margins of segments narrowly reddish ; 1st segment with a patch of greyish scale-like hairs at each side, 2nd and following segments with basal bands of white scales, on the first three or four segments these bands cover about half the segment, those on the apical segments being wider ; last two segments fringed with black hairs ; venter almost entirely covered with short greyish scales, which become yellower towards apex of abdomen.

Legs ; front coxæ red, covered with long grey hairs and a few stiffer black ones ; remainder of legs brownish or blackish, with small black spinules on intermediate and hind femora and tibiæ.

Wings ; base as far as humeral cross vein dark brown ; an irregular infuscated band stretches from fore margin through discal cell and apex of anal cell, becoming

narrower posteriorly, and hardly reaching hind margin of wing ; the infuscation is more pronounced round all the cross veins ; the discal cell has a small sub-hyaline spot near base, and another larger one near apex ; 1st posterior and anal cells open ; base of costa with some whitish scales and short black bristles ; halteres pale.

♂ Similar, except as follows : frons slightly narrower, covered with snow-white scales ; style of antennæ longer, red ; occiput narrower ; abdomen red, 1st and 2nd segments with broad basal triangular patches black ; genitalia fringed with soft red hairs.

Length 13-14 mm.

Described from 1 ♂ and 5 ♀♀ from Quetta, mostly in good condition. The ♂ however has the abdomen somewhat denuded and has lost one wing.

This is very near to *E. undans*, Walk., of which the locality is unknown. It differs as follows : the bands of white scales on the abdomen are broader in the present species, and more distinct ; the ground colour of the abdomen is darker, at any rate in the ♀ ; the neuration is similar, except that *undans* has a slight appendicular vein from lower corner of discal cell. The wing markings in the present species are very similar to those in *undans*, but they are darker, and all my specimens have the cross vein connecting the lower branch of the 2nd longitudinal vein with the 3rd infuscated, whereas this vein is clear in *undans*. The type and only specimen of *undans* is headless, so no comparison as regards the head is possible.

Both Major Austen and Mr.Collin, who happened to be at the British Museum when I was comparing my specimens with Walker's type of *undans*, consider the present species distinct, otherwise I should have hesitated to describe it.

Exoprosopa iridipennis, n. sp.

♂ Head with the eyes almost touching at vertex, but the frons at level of antennæ quite ⅓ the width of head ; frons and face nearly to upper mouth edge black, becoming much lighter at mouth edge ; frons with thick black pubescence down to the antennæ, and some purple scales both above and below antennæ ; proboscis rather long, blackish ; palpi thin, covered with bristle-like hairs : antennæ black, 1st and 2nd joints thickly covered with long black hairs, 3rd joint bare, tapering, style about half as long as joint, with a minute terminal bristle ; occiput with short greyish pubescence, and some purple scales.

Thorax black ; pronotum and sides thickly covered with rather long bright golden hairs ; dorsum covered with iridescent purplish blue scales, and with patches of snow-white scaly hairs near wing base ; below there are patches of similar hairs on the sternopleuræ, no conspicuous bristles at base of wings or on postalar calli ; scutellum brownish, with some purple scales at base, and numerous rather short black bristles along its apical margin.

Abdomen black, covered with highly iridescent purple-blue scales ; 1st segment with a patch of whitish hairs at sides ; 3rd segment with a large oval patch of snow-white depressed scales on each side, extending over the side margins, and indications of a much smaller patch of similar scales on extreme sides of 6th segment ; remainder of the pubescence black, except that there is on the posterior margins of the last two segments an admixture of scaly white hairs ; venter with the ground colour black ; 2nd segment with a triangular patch of snow-white scales, the apex of the triangle being at apical margin ; 3rd segment almost entirely covered by similar scales, 4th with similar scales at apex ; the black part of the venter is, like the dorsal portion of abdomen, covered with iridescent purple blue scales.

Legs black ; all coxæ covered with rather long greyish pubescence ; intermediate and posterior femora and tibiæ with very short spinules.

Wings hyaline and highly iridescent ; yellowish at base and in costal and subcostal cells; base of costa and all the nervures testaceous ; costa at base with very

short black bristly hairs mixed with white scales ; squamæ whitish, with moderately long white fringe ; halteres yellow ; the 1st posterior cell is unusually wide at apex.

♀. Similar ; the distance between the eyes at vertex about $\frac{1}{10}$ the width of head ; the white scales on abdomen, both above and below, less apparent. possibly because the specimen is somewhat rubbed.

Length 13-14 mm.

Deesa ; one specimen of each sex.

This belongs to the group of *E. hetrusca* Fab., and is nearest to *E. vitreicosta*, Walk., described from a headless type in poor condition. The present species is considerably larger, and the colour of the iridescent scales on the black portion is bluish-purple ; in *vitreicosta* they are distinctly of a bronzy black ; the type of *vitreicosta* has hardly indications of white scales on the abdomen.

Exoprosopa punjabensis, n. sp.

♂. Head; frons at level of antennæ about $\frac{1}{3}$ the width of head, lessening to $\frac{1}{3}$ of that width at vertex ; black above, paler below, almost white along mouth edges : frons covered with yellowish white scales, mixed with short black hairs; face with yellowish white scales ; facial bump rather small, about $\frac{1}{3}$ the short diameter of the eye ; antennæ black, 1st and 2nd joints with black hairs, 3rd gradually tapering, longer than the 1st and 2nd together, style short; occiput rather broad, with snow-white scales.

Thorax black ; pronotum with a collar of greyish hairs ; dorsum covered with long yellowish grey scales ; sides and below with long white hairs ; scutellum with long yellowish grey scales ; bristles at base of wings, on postalar calli, and on margin of scutellum black.

Abdomen black ; 1st segment and the bases of the remaining segments thickly covered with yellowish grey scales ; apical margins of all the segments except the first covered with black scales, which are mixed with longer black hairs on the last two segments; venter with the apical margins of segments broadly covered with long white scaly hairs; sides of 1st and 2nd segments with rather long grey hairs ; genitalia reddish.

Legs black ; femora with grey scales.

Wings rather short, hyaline and iridescent ; base and costal margin very pale yellowish ; all the nervures testaceous ; 1st posterior and anal cells wide open, 2nd posterior cell rather wider at apex than at base; base of costa with yellowish grey scales, mixed with short black bristly hairs ; halteres very pale testaceous.

Length 10-12 mm.

Described from 3 specimens from Ferozepore, Punjab.

Very near *E. vitrea*, Big., but there are no bright yellow hairs on either thorax or abdomen in the present species, and all the abdominal segments except the first have entire black apical bands ; from *viteipennis*, Brun., it differs in the antennæ being black, and all the wing veins testaceous.

This species, with its banded abdomen, bears a strong superficial resemblance to one or two small species of *Andrena* which occur in the same locality. When I captured my specimens I was chiefly interested in *Hymenoptera*, and thought I had caught bees until I examined them.

Exoprosopa auriplura, Walk.

By a misprint on page 212. Diptera Brachycera, Vol. I, this name is given as *auriplena*.

Exoprosopa basifascia, Walk.

E. semilucida, Walk., should be sunk as a synonym of this species. The types of both are in the British Museum, and I can see no difference between them, not in Walker's descriptions.

Exoprosopa disrupta, Walk.

Entomologist, 1871, p. 261.

There is a specimen of this species in the B. M., labelled "Ind." My own specimens are from Lahej near Aden, and it requires confirmation as Indian. The following abridged description should enable the species to be recognised.

♂ ♀. Black; lower part of frons, antennæ, and mouth edge red; face and frons with short black hairs and white scales; occiput with sparse white scales; pronotal collar pale yellow, dorsum of thorax with yellowish white scales, sides with longer grey scales; scutellum and abdomen more or less covered with grey scales, forming bands (often denuded) at the base of abdominal segments, which bands are usually most conspicuous on the 3rd and 5th segments; abdomen of the ♂ more or less dark red; femora and tibiæ reddish; wings with dark baso-costal bands and all the veins, but more especially the cross veins, broadly suffused.

Length 8-13 mm.

(*to be continued.*)

THE SNARE OF THE GIANT WOOD SPIDER (*NEPHILA MACULATA*)

BY

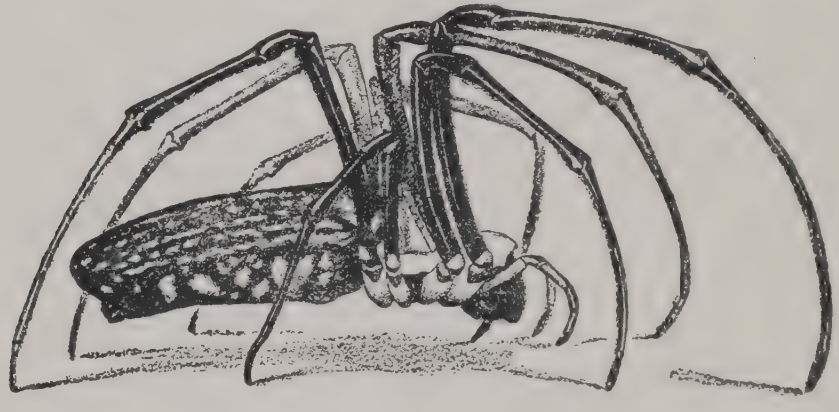
CAPTAIN R. W. G. HINGSTON, I.M.S.

PART I.

(*With 2 text figures*).

Some of my earliest observations in natural science were given to the wonderful work of the spiders that weave geometrical snares. It was in a beautiful and secluded valley of the Himalaya, and the spider which disclosed the secrets of the architecture was the humble and insignificant species, the *Araneus nauticus*.*

Eight years have passed since these investigations were made, and many a time have I reviewed the work and followed the stages of the architecture again. Often of an evening, when chance has offered, I have watched the exquisite fabric assume its geometrical beauty and shape ; I have noticed how the different species possesses each its own special peculiarities and ways, yet for a long time I met with none which made any wide or important deviation from the main principles originally observed. But fortune in the end will always favour those who watch and wait. At length the time arrived when another of the Epeiridae displayed her workmanship, and revealed a succession of varied secrets that satisfied my highest hopes.



Giant Wood Spider (*N. maculata*).

(From the Fauna of British India (Arachnida).

The species is none other than the *Nephila maculata* ; in this vast country the most handsome and most powerful of its kind.

How very different from the insignificant *Araneus* is this great conspicuous giant of the woods. The *Araneus* is a small and globular spider, a little brown species with stumpy legs, only one quarter to one half an inch in length. The *Nephila* is an elongated monster, variegated in brilliant colour, with long and slender limbs and four to six times as large. Equally wide is the difference between their snares. Both are of the same geometrical pattern ; but that of the *Araneus* is a fragile structure, on an average some ten to twelve inches in width; while the *Nephila* spreads out a strong sheet of silk with a diameter of five feet. I found the *Araneus* over the streams and pools that nestle amidst the rocky glens. I come on the *Nephila* in more gloomy haunts. She is a resident of the dense and leafy jungle, a true inhabitant of the woods.

I must briefly describe the splendid architect herself. It is of course the female which is responsible for the work. In front her head and thorax are welded

* The architecture has been fully described in " A Naturalist in Himalaya."

into a quadrangular mass. It is clothed above in a pale yellow velvet, and armed in front with a pair of black massive jaws. Alongside the jaws are the hairy palpi. Each is bright yellow in its proximal half, while the remainder is a dense black. Behind the thorax is the ponderous abdomen shaped like a truncated cone. The base is in front, vertical and abrupt, and connected with the thorax by a narrow moveable hinge. Behind it terminates in a blunt round point, and beneath the tip is a reddish prominence which supports the compact cluster of the spinnerets. The abdomen is strikingly decorated with a pattern of spots and lines. Its general colour is a dense black relieved beneath by a reddish tinge and a diversity of yellow spots. On either side of the cone the markings are more delicately laid. They consists of five longitudinal streaks of pale yellowish wavy lines. On its upper surface the abdomen is more vividly adorned. A pair of bright longitudinal orange bands traverses it throughout its length, while in front are three broad transverse stripes of which two are brilliant orange and the intermediate one is black. The legs are extraordinarily long and slender, the fore leg being no less than three inches in length. All are black in colour with a yellow spot beneath the joints. They are clothed in delicate hairs and spines, and terminate in minute claws. Such is the largest of our Indian spiders. It has a span of six and a half inches, and its body is one and a half inches in length.

The magnificent snare of this great spider can be spun only in some special site. In diameter it is almost the height of a man; and consequently a clear wide space is necessary for the expansion of so immense a net. The spider knows well the most suitable place. It spreads it across some open clearing between the branches of the forest trees. It often selects a pathway or a shady water course, or it finds a tunnel in the tangled growth where the insects pass to and fro. Frequently it secures it above to the branches, and anchors it below by silken filaments to the low-lying foliage on the ground. It is only in these secluded spots that we find this marvellous sheet. There is no work of architecture more worthy of our note. It is so delicate, so beautiful, so immense; it has such a wonderful appearance of exactitude and of geometrical precision in all its parts. It is like a great transparent wheel, spread out as an invisible barrier and stretched tight between the forest trees.

Given the favourable opportunity, we can witness no more fascinating work than the great *Nephila* at the architecture of her snare. She teaches us many detailed truths which the little *Araneus* could never show. She is of such size and bulk that all her complex movements are magnified to a much larger scale. Moreover she is so deliberate in every motion; she performs every act so slowly, so decidedly and with such a movement of determination and precision that it is easy to follow the geometrical principles that underlie the intricate architecture of the snare. She thus yields more to observation than does the small and hasty *Araneus*, and I will endeavour to tell the additional facts she has disclosed.

Though permitting of close observation, nevertheless she is timid and shy. At the slightest touch on her snare she immediately dashes away to the margin, and waits there till the danger has passed. She will work only in quietness and solitude and under cover of the darkness of night. It needs much patience and a quiet search to see this architect at her toil. None have tried my patience higher; none have rewarded it more.

I now turn to the workmanship, and I ask the reader's permission to repeat what I have elsewhere described. I must state again the essential features in the construction of the ordinary geometrical snare, for, unless the normal process is borne in mind, it will not be possible to realize the new lessons which the *Nephila* has to tell. Let us therefore first consider the ordinary geometrical snare. It is fashioned in this way.

The hour of work is at hand, and the spider is isolated on a blade of grass standing in a narrow stream. "The first essentials are some foundation-lines to serve as a framework for the snare. The spider begins. It climbs to the tip of the blade of grass; it elevates its abdomen and from the spinnerets emits a silken filament to the wind. The light filament is wafted to the shore, becomes entangled in another blade of grass, and the first foundation-line is in place. Backwards and forwards runs the spider along its line, adding each time a new filament, doubling, trebling, quadrupling the line until it is strong and sound. The first foundation-line is secure. For the second foundation-line the spider adopts a different procedure. It takes its stand about midway on the first line and suddenly drops down suspended on a filament of silk. Perhaps it finds an attachment. If not, it climbs up again and drops down from another point. At length it meets a blade of grass and anchors its second line. By joining these points together with a filament of silk a triangle is formed of three foundation-lines, the simplest form of framework to support a geometrical snare. The spider reinforces these lines with additional filaments until it is satisfied with the strength of the scaffold. This is the first and elemental stage; the construction of the foundation-lines.

I now come to the second step in the architecture. A triangular framework is in position or if suitable connections can be found, a trapezoid figure is more to the spider's choice. Whatever its shape, the spider next proceeds to construct the radii. These are the spokes of a wheel that diverge from a common centre to end at the foundation-lines. The spider constructs them with little trouble. It first runs a line from side to side across the framework. Then, selecting a point on that line which will be the future centre of the snare, it carries a number of lines from that central point to the circumference of the snare. In this way it completes a series of radii, each equidistant from its adjoining radius. Each radius is in accurate position; all diverge equally from the common point. The second stage is mathematically complete.

Now comes the third stage, the construction of a hub. The snare in its present state resembles a wheel. It has a centre, radiating spokes, and a rim formed of its foundation-lines. The spokes need some strengthening at the point where they leave the centre, the wheel requires a hub. This the spider proceeds to make. It winds five turns of a slender filament around and close to the central point, attaching the filament to every spoke. A hub is thus added to the wheel; the spokes are bound together at their inner ends and the third stage is complete.

The fourth step in the work is the formation of a temporary spiral. This adds a further strength to the snare, holding the radii still more firmly in place. The spider takes four turns round the hub, stepping from radius to radius and attaching the filament every time it passes a spoke. A spiral of four turns, like the hair-spring of a watch, is thus wound about the centre. All the turns are parallel, all accurately placed. The work is perfect and precise. This is the fourth stage in the architecture, the construction of the temporary spiral.

The spider now reaches the fifth and most important step in its work, the formation of the viscid spiral. It proceeds to the outer margin of its snare close to where a radius joins a foundation-line. It now commences to wind another and much longer spiral round and round the snare, commencing at the circumference, working towards the centre and attaching the spiral at every spoke. To pass from radius to radius it uses the temporary spiral as a bridge. Now this viscid spiral is the vital element of the snare. It is continuous in closely parallel lines from the circumference to the very centre. It is covered with a highly viscid fluid, while all the other lines, the radii, the hub, the temporary spiral are non-adherent to the touch. It is that part of the fabric that has the power of capture. The formation of the viscid spiral is a laborious task; it occupies the spider more time than all the rest of the snare. It is a fine

and subtle filament, often continuous from end to end. Every line is parallel, and the whole is a wonderful work of mathematical beauty and precision. The spider at length completes its viscid spiral. It anchors the end close to the centre, and the snare is finished.

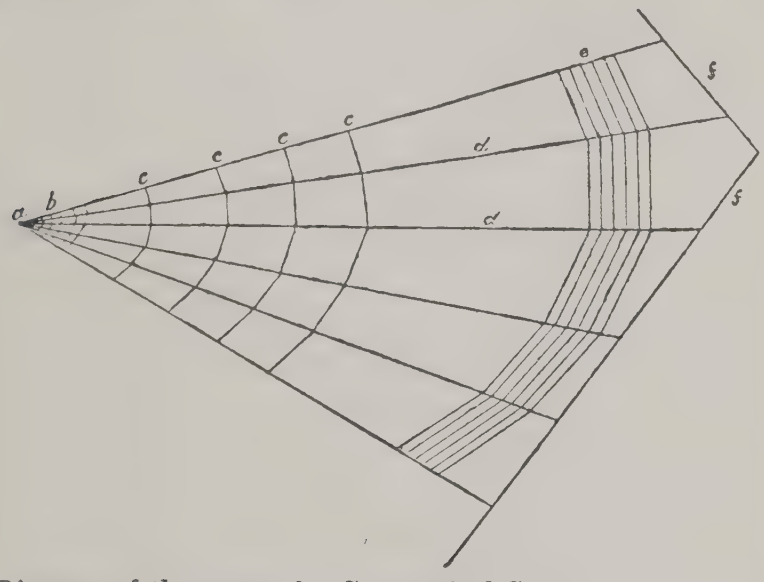


Fig. 1 Diagram of the parts of a Geometrical Snare.

(*a*) Centre.
(*b*) Hub.
(*c*) Temporary spiral.
(*d*) Radius.
(*e*) Viscid spiral.
(*f*) Foundation line.

Such is the construction of the geometrical snare, a work of the most marvelous texture. There are five successive stages in its architecture (see Fig. I.).

1. The foundation-lines.
2. The radii.
3. The hub.
4. The temporary spiral.
5. The viscid spiral."

Bearing these main principles in mind , let us now inspect the work of the *Nephila* ; let us see how she varies from the common mode of workmanship, let us consider the additional lessons which I find she is able to teach.

Armed with patience and a lantern, we move out into the jungle by night. We pass to some dark secluded spot chosen by the spider for her snare. Earlier in the morning we cut away the structure leaving a few foundation-lines in place. All day long the *Nephila* has been hanging to a broken thread. She will not think of work until some hours after the sun has set. We sit down with the light near the fragments of the old snare. We prepare for a long and patient wait. In all likelihood it will end in failure ; for the *Nephila* will often resent our interference ; if so, then she will scramble away into the foliage and seek for some more welcome nook elsewhere. But we wait in the hope that she will reconstruct her architecture in the place where we have cut it away.

The weary hours drag on the lamp flickers at our side ; later the moon sheds a faint gleam of light, and we are filled with a sense of solitude and wonder, a veneration for the great unknown. We hear the chuckles and the hootings of the birds of night, the trumpet of the sambhar, the growl of the leopard, the roar of the king of Indian jungles that reverberates through the peaceful woods. We see the ghostly shapes of the forest trees, the deep dark spaces beneath their dripping boughs, and we feel the awe-inspiring influence of nature in the dark and lonely silence of the night. But we must watch and wait alone. None would join us in a midnight sitting merely to contemplate a spider at her work.

We persist. At length we are rewarded ; the *Nephila* begins to move. She at last takes up the first thread of her wonderful work. Let us follow the successive stages of her architecture and observe what she has to show.

She thoroughly explores the vicinity, wandering about the branches, searching everywhere with her long legs until in the end she satisfies herself that the place is suitable for work. Then she begins at her old foundation-lines, strengthening and repairing the injured framework so as to make it suitable to enclose the snare. She hangs back-downward from her lines ; she climbs backwards and forwards along them ; she doubles, trebles, and still further reinforces them until they are sufficiently firm and strong. With her slender limbs she sweeps the air as she slowly climbs along her threads. In this way she searches for suitable attachments. The act is very deliberate and precise. First she suspends herself by the legs of the right side and with the left ones she sweeps the air. Then she reverses the process. The left legs become the organs of suspension and those on the right side commence to explore.

We can learn a few little facts even in this early stage. We can observe that the spider's non-viscid thread, though apparently only a single filament, is really composed of a number of strands fused into one line. Owing to the large size of the spider we are able to detect this. The cluster of three, or perhaps four, filaments can be seen to emerge from the spinnerets, and to blend into a single thread about an inch or less away. Sometimes they will remain for a distance of two or three inches as separate and independent lines.

Another little point that we cannot but observe is the mode of fixation of the line. It is by no means just a simple touch with the spinnerets. This great spider shows us that it is a very definite and decided act. The spinnerets are first pressed against the point of anchorage, then the abdomen is rocked firmly from side to side ; a small quantity of viscid matter is squeezed out from the spinnerets, and this glues the non-viscid line in place. We inspect carefully the point of fixation and we see a tiny white flake of glutinous material; it is the substance by means of which the attachment has been made.

A third fact easy to corroborate is that on all occasions a strain is necessary in order to draw the filament from the spinnerets. The spider has no power to emit it by muscular force. Indeed, on occasions, she may sometimes move a little backwards, and then the filament hangs loose owing to the loss of the external strain. The line is always drawn from the belly of the spider by some traction from the outside. She is incapable either of drawing in or of shooting forth her own slender thread.

We now come to the next act in the architecture, namely the drop which the spider makes in order to fix her first vertical line. She falls, seeking an attachment below, and allows herself to swing at the end of her almost invisible thread. But the point to be observed is this. The spider does not swing in such a way as to permit a strain on her spinnerets. Indeed such a mode of suspension would be impossible. It would result in the line continually running out. The spider prevents this by stretching up one hind leg and hooking the terminal claws over the suspension line. The claws there act as a check ; it is they which take the weight and strain, and they prevent the suspension line from running free from the spinnerets. Nor are the other legs idle while the spider is swinging from her line. She spreads them wide apart ; they grope around and search the air. They are waved about in all directions, and, since they cover an expanse of over six inches in diameter, they supply the spider with an excellent means of finding a point for the fixation of her thread. Should the spider fail to secure an attachment, she will again climb up her line. Her mode of ascent is thus. She has been swinging head downwards holding her filament with a hind claw. She now turns about. She ascends by a hand over hand motion, employing the claws of all the three front pairs of legs to haul her up the thread. But the ascent is a wasteful mechanism for the spider, the

slack line which is drawn down cannot again be absorbed into the spinnerets and is thus permanently lost.

As was observed in the case of the foundation-lines, so also is the single filament of suspension formed by the fusion of a number of threads. They can be seen escaping in a delicate cluster from the very front of the spinnerets. Now occasionally, while the *Nephila* is suspended in the air, she gives forth another filament which she permits to float away upon the breeze. She has failed to find an attachment with her long and raking limbs, and now she begins to search the air by the aid of an extensive line. But let us observe the act in a little detail. We will first detect the fact that the line given to the wind escapes from the posterior spinnerets, while the suspension line emerges from those in front. Excellent arrangement. The line given to the wind must float away behind the spider. Did it not come from the hindmost spinnerets then it would get entangled in the suspension line. But there is another point. The flotation line, that is the one given to the wind, is, like the suspension line, not a single but a complex thread. Yet its composition is the exact reverse of the suspension line. It emerges as a single filament and ends in a cluster of threads. This terminal brush is the aerial support which permits it to float freely on the breeze. This little fact I have elsewhere described. The new point revealed by the *Nephila* is that the spider can emit at the same moment two lines constructed on a reverse plan. The one is from the front of her spinning wheel; it is a fixed suspension line composed of a cluster of strands which fuse into a single thread. The other escapes from the hindmost spinnerets; it is a free flotation line consisting of a single filament which terminates in a sheaf of threads. What a wonderful and efficient spinning apparatus to produce such diverse work as this!

I pass now to the next stage in the architecture, the method by which the radii are distributed through the snare. Remember first the work of the *Araneus*. She spreads abroad her radiating spokes, about twenty in a moderate snare. They are all equidistant; they all diverge evenly from a common centre; they form a perfect and symmetrical wheel. Now let us follow the *Nephila*, and see how she varies from the common plan. Like the *Araneus* she lays her radii haphazard; a few on one side, then a few on the other, without working on any apparent scheme. The *Araneus* fixes her radii in this manner. She climbs out along one radius paying out her filament behind her; she reaches the foundation-line; she takes four paces along that line there she halts, draws tight her filament, secures it to the foundation line, and her radius is in place. She then climbs back along this new radius, anchors her thread at the centre, and thus duplicates her spoke. Now, in what way does the *Nephila* act? She also climbs out from the centre to the circumference, but in the first half of the journey she clings to a pair of radii; then she drops one of the two, and in the same way as the *Araneus* continues her climb to the end. An essential difference now occurs. She does not, like the *Araneus*, move forward four paces, fix her line, and then climb back again along it. She advances a distance of one inch, anchors her filament, and the radius is in place. But she does not halt here and return to the centre. She makes a second advance over an equal distance. Then she again fixes a line. This done, she climbs back along an adjoining radius, and at its inner end she attaches her thread. Thus, as a result of the return journey, a second radius in in place. This is therefore a very different mechanism from that employed in the ordinary snare. The *Araneus* at each journey to and from the centre lays out only one radius, but, since she climbs back along her new spoke, she manufactures it of double strength. The *Nephila* in the same journey constructs two radii, but since she returns along an adjoining radius, therefore each consists of only a single line.

Now for another difference. All the radii in the snare of the *Araneus* diverge evenly from the centre in the same way as a series of spokes radiate from the hub of a wheel. It is otherwise in the architecture of the *Nephila*. She supplies

her snare with a system of branching spokes. All her radii are not, as in the snare of the *Araneus*, clear straight lines undivided from end to end. On the contrary, many of them after a greater or less distance break into two, and thus reach the circumference as a pair of spokes. Let us investigate how this is done. The *Nephila*, unlike the *Araneus*, does not first complete her radii before commencing at her temporary spiral. Both stages occupy her at the same time. Now she lays out a few radii, now she takes a few turns at the spiral, then she resumes the radii again. Furthermore, while constructing her radii, she does not work from the centre, but rather from the last turn of the temporary spiral which she has laid down. If this statement is clear, then it should be obvious that, on the spider's return journey after fixing one end of the second radius at the circumference, she does not continue all the way to the centre, but halts at the outermost turn of the temporary spiral and there anchors her thread. Thus at the point where the radius and the temporary spiral meet there the radius will appear to divide. As a consequence of this peculiar mechanism the radii are seen to branch in all parts of the snare. Some divide near the centre, others near the circumference, and the point of division is always where a radius and a spiral meet. Thus we cannot count the number of the radii. at least the number will be much less near the centre than near the circumference of the snare. An idea of this branching will be gained by making the circular count. An inch from the centre they number 28 ; four inches from the centre they are 80, and at the circumference 112. Indeed it is clear that, in a strict sense, they are not radii or spokes at all.

I pass now to explain why these peculiarities exist, since there is always a good reason for everything we see. The great increase in the number of the radii depends of course on the immensity of the snare. They are the scaffolding of the architecture and must support it at every point. Twenty are sufficient for the little web of the *Araneus* ; over a hundred are required for the *Nephila's* sheet. Moreover the radii are much closer together than they are in the ordinary snare. This likewise depends on the vast area of the sheet. Compare it with a mechanical wheel. A small wheel can be made with only a few and widely-separated spokes ; they are sufficient to give it rigidity and strength. But increase the circumference, and many more must be provided, and they must not be far apart. The rim must be supported at many and closely-connected points, otherwise the structure will collapse. The mechanism is essentially the same in our comparison between the two snares.

At each journey the *Nephila* completes two radii, while the *Araneus* manufactures only one. This deviation has a value ; it makes for economy in the architecture, an economy not only in time, but, since each radius is a single thread, an economy also in the expenditure of silk. The saving of time must be of some importance,since the laying of the radii is a tedious work, and a much more prolonged operation than in the case of the ordinary snare. So also is it a service to the spider not to waste her precious silk, especially in so immense a snare which contains such a multitude of lines. Possibly the strength of the architecture is diminished by the confinement of each radius to a single thread. But compensation is made for this by the great increase in the number of the spokes.

The employment of branched instead of unbroken radii is another ingenious method of securing economy in material and of adapting the system of radiating spokes to the extensive area of the snare. Indeed, without the adoption of some such mechanism, it would, I think, be quite impossible for the spider to extend so wide a sheet. She may be an inimitable architect. But it is beyond even her constructive powers to lay out over a hundred lines that diverge equally from a common point. At the point of divergence they would be so massed and crowded that the spider would be utterly unable to manipulate the individual threads. She could never separately distinguish them nor

distribute them evenly over the surface of her snare. Furthermore she would waste her material by collecting so large a number of radii all at one central point. She would only unnecessarily overburden that portion of her architecture by placing there an excessive number of radii where a few would give sufficient strength. By making use of a branching system she obviates these defects. She adapts her architecture to the immensity of her snare. She simplifies her work ; she saves her material ; she more evenly distributes the strength of her scaffold ; she economizes her valuable time.

The next point that needs consideration is the method by which the *Nephila* measures the distance between her spokes. For only by some geometrical operation could she produce so exact a work. The *Araneus*, I have said, performs the act in this way. She climbs out along a radius; she reaches the foundation-line; she takes four paces along it; and then affixes her thread. It is by the advance of four paces that she measures the interval between her spokes. By keeping strictly to this number she spreads her radii evenly through her snare.

Now this method will not suit the *Nephila*. If she made four paces between each pair of radii, then her spokes would be very widely spread, while it is essential that they should lie not far apart in order to support so large a wheel. She must adopt some other method, and this is how she gains her end. She moves out along the radius ; she reaches the foundation-line ; she advances along it. So far it is the same as the *Araneus*. But watch her hind leg. The claws at the tip are hooked over the radius along which she has just climbed out. She advances, but she does not release her clutch on the radius. As a consequence her hind leg becomes stretched tightly behind her. When this happens she lowers her spinnerets, anchors her filament, and secures a new spoke. She has measured off the distance for her first radius; it is the interval between her spinnerets and the tip of her hind leg. She now releases her hold. She again advances and hooks the same hind claws over the radius that she has just laid. She continues to advance until her leg is again outstretched in the same position as before. Once more she anchors her filament and the second radius is measured off. In this way she continues all round the snare, at every journey measuring a pair of spokes. All her radii are evenly separated at the circumference, and the distance between the spinnerets and the tip of the hind leg is the simple measuring-rule employed.

In this manner are the radii secured. I have tried to explain the various deviations, and to show the essential importance of each to the particular character of the snare. This laying of the radii is a wonderful sight. I know of no more striking architecture of its kind. Imagine, it is midnight in the silent woods. Before us is a great vertical wheel with a diameter as tall as a man. It is supplied with a hundred spokes, transparent, slender rays of silk which sparkle where we shine the light. Yet so delicate, they are all firm and strong ; yet so numerous, they are all geometrically exact; and they are spread abroad with perfect uniformity over all this immense sheet. Amidst them moves the great architect herself. She looks at first sight an unwieldy creature, groping aimlessly and fruitlessly with her limbs, and scrambling out over the invisible sheet as though she were climbing unsupported in the air. But it is not so. She is a marvellous and consummate architect. She works with a perfect regularity and precision; she weaves with an inimitable skill. Every movement of her widespread limbs has a definite act in view. They are now feeling, now testing, now touching, now measuring ; they are building the most fascinating work of architecture that I have ever had the privilege to see.

Let us pause. The construction of the radii is more than sufficient to engage our attention here. In the next chapter we will follow to its final completion the architecture of this geometrical snare.

(to be continued.)

"THE BIRDS OF MESOPOTAMIA."

BY

CLAUD B. TICEHURST, M.A., M.B.O.U., late Captain, R.A.M.C.

ASSISTED BY

P. A. BUXTON, M.A., M.B.O.U., late Captain, R.A.M.C.

AND

MAJOR R. E. CHEESMAN, M.B.O.U., 5th Buffs.

PART III.

(*With 2 plates.*)

Continued from page 427 of this Volume.

190. White Pelican. Pelecanus onocrotalus.

1. *Pelecanus onocrotalus onocrotalus.* L. (Syst. Nat., 1758, p. 132—Africa)
2. *Pelecanus onocrotalus roseus,* Gm. (Syst. Nat. 1, p. 570, 1788—Manila)

191. Dalmatian Pelican. Pelecanus crispus.

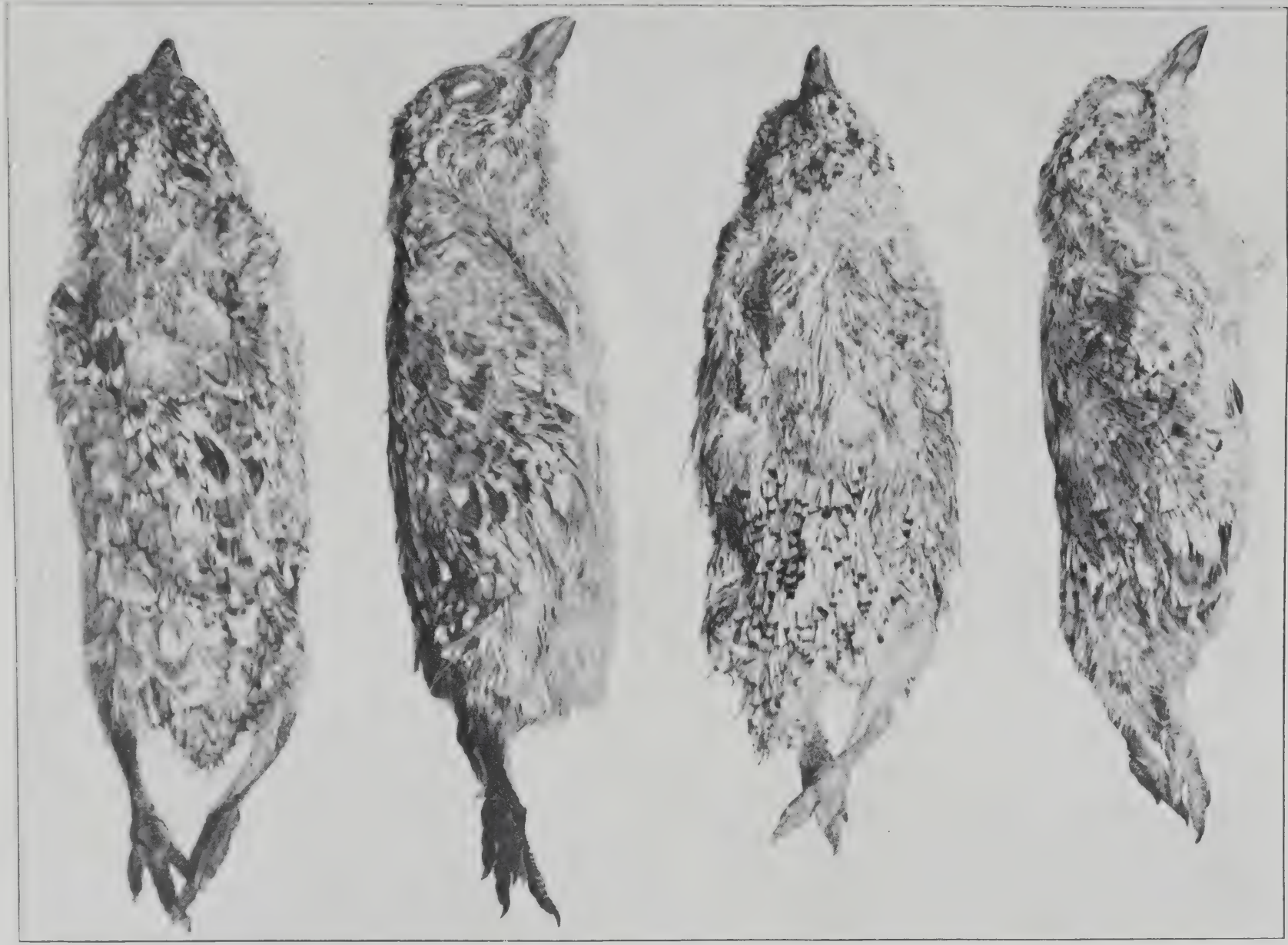
Pelecanus crispus, Bruch (Isis., 1832 p. 1109—Dalmatia).

The information to hand about Pelicans is not at all satisfactory and fails to clear up the status of these birds. White Pelicans appear to be common. Magrath noted thousands on the Suweikieh marsh in August and says they had quite small young with them. Elsewhere on the inundations huge flocks are to be seen from time to time as the state of the water is favourable or otherwise, as at Kut, Nukta, Amara, near Baghdad, etc., and nearly all records relate to the months of November to April while Pitman noted a migratory movement at the end of February, flocks then travelling north, and he says that Pelicans were absent from the Baghdad floods from April 23rd to the end of July.

Of the Dalmatian Pelican we have but few records ; it was noted by Pitman at Fao and Amara in winter and seen occasionally at Tekrit by Logan Home also in winter ; Zarudny gives it as a winter visitor.

Pelicans breed near Fao whence Cumming sent to the British Museum a number of specimens, chicks and eggs. These specimens Mr. Kinnear has kindly hunted up for me and examined ; of *roseus* there are three immature specimens and an adult, the latter is dated October 24th, 1886, the others bear no date ; of *onocrotalus,* there are two adults and two immature birds, one in December, the rest bear no date. There are two feathering chicks ; in the *onocrotalus-roseus* group the feathering on the forehead ends in a point, in the *crispus-philippinensis* group the feathering ends in a concave margin and judging by this Mr. Kinnear says these chicks are those of *crispus.* In the Ibis, 1891, p. 116, Sharpe referred an adult head, eggs and apparently these chicks (dated October 24th, 1886) to *mitratus* (= *onocrotalus*).

Whether both species breed in Mesopotamia is a matter which requires future investigation as does the status of all three birds, and breeding specimens are desirable.



CHICK OF LARGE PINTAILED SANDGROUSE
(*Pterocles alchata caudacuta*)

CHICK OF SPOTTED SANDGROUSE
(*Pterocles senegallus*)

N.B.—Both about the same age ; note smaller, weaker bill, smaller feet and paler colour scheme of *senegallus*.

192. Cormorant. Phalacrocorax carbo.

Phalacrocorax carbo subcormoranus (Brehm). (Ornis, I, p. 42, 1824—Holland).

The Cormorant is a not uncommon winter visitor to the rivers and deeper floods or lakes, from Tekrit and Ramadi to Fao ; it is recorded from October to May, on the 18th of which month Buxton saw a few on the Hamar Lake, but found no evidence of its breeding there nor are there any records suggestive of its doing so in any part of our area.

It moves about locally in winter, doubtless as food supply directs. Cheesman noted that a passing flock flying high were much terrified on meeting an aeroplane and scattered in all directions, quite a different behaviour to Storks under a similar circumstance.

Four specimens obtained : ♀, Sheik Saad, 13-3-17 (Ingoldby) ; ♀, Amara, 4-2-18, w. 334. B. 59 mm. ; ♀, 4-2-18, wing 319, B. 61 mm. ♀, Hamar Lake, 20-5-18., w. 340. B. 66 mm. (P. A. B.).

These birds certainly belong to the smaller European-Asiatic race and not to our familiar form of the British Islands.

193. Pygmy Cormorant. Phalacrocorax pygmæus. "El Echi."

Phalacrocorax pygmæus (Pall). (Reise Prov. Russ. Reichs, ii, p. 712. 1773—Caspian Sea).

Common and resident, breeding in some of the marshes and moving out locally to the rivers and other marshes in winter. Tomlinson received a number of eggs on May 15th, which had been taken by Arabs in the marshes near Ezra's Tomb. An Arab, who knew the marsh birds well, told Logan Home that the Cormorants at Abu Aran in 1919 had nested in April. Pitman saw Cormorants probably of this species in the marshes near Museyib on June 12th, and Cheesman saw many on the Horr Sanaf at the end of March, but no one seems to have actually come across a breeding colony, though probably many must exist in the Euphrates marshes and those to the east of Amara and Ezra's Tomb ; Buxton obtained adults on the Hamar Lake on May 20th.

Specimens examined : ♀, Horr Sanaf, 20-3-18 (P. Z. C. and R. E. C.), ♀, Hamar Lake, 20-5-18; (two) ♀, Ezra's Tomb, 23-12-18; (three) ♂, Horr Hawaize, 13-7-18 (P. A. B.).

These all belong to the European form *pygmæus* and not to the Indian *javanicus*. The younger birds, in the brown dress, of *javanicus* never seem to have the white filo-plumes on the flanks, rump, mantle and sides of neck which specimens of *pygmæus* in similar state of plumage have.

194. Shag. Phalacrocorax, sp. ?

Several observers noted Shags in winter ; Buxton says he saw them several times in November and December near Amara, Meinertzhagen saw one at Tekrit which he says was a very old *graculus ;* no specimens were obtained and so it is impossible to say what these birds were. Stoneham too saw many on islands below Baiji, and particularly noted some with crests.

The Common Shag (*graculus*) is entirely a west European bird and the Mediterranean Shag (*desmarestii*) is not certainly known east of the Grecian islands, while the Indian Shag (*fuscicollis*) is hardly known west of Sind so it would be of great interest to know what these birds in Mesopotamia really are.

195. African Darter. Anhinga rufus. "Warda."

Anhinga rufus rufus (Lacep.) (Tab. Ois. Daudin, Buffon's Hist. Nat. xiv, p. 319, 1802).

The Darter is common and resident in the huge marshes round Kurna and east of Amara and Ezra's Tomb. Elsewhere we have no records of it. No one seems to have found it nesting but Tomlinson had a number of eggs brought to him on

May 15th from the Ezra Tomb district by the Arabs. Only one specimen was obtained, a male from Ezra's Tomb on February 23rd, by Buxton. I have compared the bird with a large series of African birds; these latter vary very much *inter se* according to age and perhaps individually, and I can match this Mesopotamian bird in every detail with many African skins. A race has been described from the sea of Antioch by Oustalet as *chantrei* (Ann. Sc. Nat., Paris, July 1882, art. 7). All the differentiating characters which Oustalet gives for his race are to be found in many African birds, as already pointed out by Tristram (Ibis., 1886, p. 41); whether *chantrei* is really separable from *rufus* I do not know, but as this Mesopotamian skin cannot be picked out from a series of African ones I must place the Mesopotamian birds as belonging to the typical race, at any rate for the time being.

Mr. Jourdain informs me that of Darter's eggs he received from Tomlinson (sub nomine *chantrei*) "some were white, unmarked and some had the peculiar violet brown blotches already noted in the eggs of this species by Ottosson in eggs from the Lake of Antioch."

196. Grey Lag Goose. Anser anser.

Anser anser (L.) (Syst. Nat. Ed., x, p. 123, 1758—Sweden).

Grey Geese are extraordinarily abundant in the great marshes and swamps of lower Mesopotamia. The main flocks arrive about the last week in October, and from then onwards flock after flock may be seen passing over or arriving daily at their winter quarters, though the first flocks may arrive a week or two earlier. Early in March flocks may be seen again wending their way north and most of the winter visitors have gone by the end of the month. Both of these geese are abundant in winter and many are caught by the Arabs and brought into the markets, such as at Amara, alive for sale.

The Grey Lag Goose besides being a winter visitor is certainly also a resident in small numbers, and very late and very early records probably belong to those birds which remain during the summer in the marshes. Thus Logan Home reports some still left, *mostly paired*, on May 5th, and there are quite a number of records of small numbers seen throughout July in such places as Suweikiyeh marsh, marshes near Ezra's Tomb, and at Gurmat Ali and Akkarkuf in early August. On May 21st when Buxton was at the Hamar Lake he obtained three goslings from the Arabs who had caught them in the reed beds there; two of these were eaten by mud turtles and the third Buxton preserved. Both Buxton and Cheesman say that they have never seen domestic geese in the country, nor any semi-tame Grey Lags in any of the villages; so that it seems perfectly certain that some Grey Lags stop and breed in the marshes. "Gaggles of Grey Lag used to fly in the early morning above no man's land on the way to the Suweikiyeh marsh and were invariably greeted by a ragged fire from the Turkish front line. On one occasion a bird was dropped behind our front line trenches and was safely retrieved, although a machine-gun was laid on to it. The O. C. snipers in my battalion brought down one with his rifle; and aeroplanes used to practise their Lewis guns on these birds. Many of the gaggles which frequented the marshes near Basra roosted during the day well out on the bare desert" (Magrath). Flocks of Geese passing overhead afford tempting shots with a rifle but very few were obtained in this way.

Three specimens examined:—Legait, 12-16 (Livesay); Samarra, 25-12-17 (C. R. P.); *pull* Hamar L. 21-5-18 (P. A. B.).

197. White-fronted Goose. Anser albifrons.

Anser albifrons (Scop.) (Annus 1, Hist. Nat., p. 69, 1769—Carniola).

There is little to add about the White-fronted goose, it appears to come and go at the same time as the Grey Lag. There is no suggestion that it breeds in

the country, nor is it likely to do so, as its known southern limit of breeding range lies much further north. It is very common in winter and large numbers are brought into Amara market alive.

Five specimens examined : Samarra, 22-12-17 (two) (C. R.P.), Mesopotamia and (Bagnel), Amara (two) (P. A. B.) .

198. Lesser White-fronted Goose. Anser erythropus.

Anser erythrŏpus (L.) (Syst. Nat. Ed. x, p. 123, 1758—Sweden).

Apparently not at all common ; Buxton obtained one out of a small party on some wet irrigated plough land at Amara on November 28th and thought he saw others at different times. Thornhill recorded a flock of five at Wadi on March 20th ; Pitman saw a flock at Suweikiyeh marsh on December 3rd. Zarudny records it in winter and he also records *Anser arvensis* as a rare winter visitor ; we have no records of any Bean Goose and Buxton failed to meet with it among great numbers of geese in the Amara bazaar.

Pitman seems pretty sure that he saw the Red-breasted Goose on several occasions round Kut, Kurna and Qalet Saleh in winter ; Thornhill records that he heard of vague statements regarding geese which seemed suggestive of this species, so awaiting further evidence I do not definitely include it ; it is abundant on the south Caspian coast in winter and so might easily occur in Mesopotamia.

199. Mute Swan. Cygnus olor.

Cygnus olor (Gm.) (Syst. Nat. pt. 2, 1789, p. 501—Russia).

Swans are evidently rather rare winter visitors to Mesopotamia. Butler has recorded (S. F., 7, p. 105) that he learnt through the telegraph people at Fao that swans occasionally occur at the head of the Persian Gulf and mouth of the Euphrates.

In the winter of 1916 a herd frequented the Suweikiyeh marshes, as recorded by Thornhill and others ; but what species of swan it is that visits the country was unknown until Robinson secured an adult female at Kut on January 8th, 1918, and sent it to the Bombay Museum ; it turned out to be of the above species.

200. Common Shelduck. Tadorna tadorna.

Tadorna tadorna (L.) (Syst. Nat. Ed. x, p. 122, 1758—Sweden).

In lower Mesopotamia this species is a fairly common winter visitor to the shallower floods and is, as elsewhere, extremely wary ; round Baghdad however and perhaps elsewhere it must breed, as Pitman on July 22nd at L. Akkarkuf saw adults with young ones, and caught and reared four of the latter ; there are several other records which shew that some, at all events, are to be met with at a time when they might be supposed to be breeding ; thus Logan Home records seeing pairs in May, as also did Pitman at Nukta on May 28th, and Thornhill recorded seeing at pair at Hanna on July 11th ; one was seen at Azizieh on June 18th.

Four specimens examined : Amara (P. A. B.), Mesopotamia (Macdonald) Busra (Wernicke) Juv. L. Akkarkuf, 15-8-17 (C. R. P.).

201. Ruddy Shelduck. Tadorna casarca.

Tadorna casarca (L.) (Syst. Nat. Ed. 12, 3, App. Anim., p. 224, 1768—Astrachan).

On the Adhaim river and on the Tigris north of this to Tekrit and probably beyond, and also round Bund-i-kir in the Karun district, the Brahminy duck is resident and breeds ; to the rest of Mesopotamia it is a moderately common winter visitor. Pitman says that at Istabulat it breeds in ruins, cliffs, marl

mounds and canal banks ; it was nesting in May and June, the holes going 14 feet in and 7 feet below the level of the ground. Thornhill, who found a nest of eight eggs in low hills near Samarra says the nest was situated 20 feet in and four feet down, they were nesting in April and May. Logan Home put several old birds out of nesting holes in the cliffs of the Samarra-Tekrit area and found a duckling in June. Harrison says of the Adhaim river that the birds were paired off in April and were breeding in May. In the above districts it is fairly common. Tomlinson has recorded it breeding on the Gagar river in April 1908 and found young out in June ; on re-visiting the locality in 1913 no trace could be found of any breeding there and he was told by the natives that none had bred since 1913 ; Cheesman however saw pairs which were evidently breeding in much the same locality, *i.e.*, near Bunder-i-kir on May 24th, 1917. Though it occurs on the Euphrates at Ramadi and Feluja in winter, there is no evidence as yet that it breeds there ; Pitman failed to meet with it at the latter place after May 7th.

One specimen : Amara, 13-1-18 (P. Z. C. and R. E. C.)

I will not swell the list of Mesopotamian birds by including the Egyptian Goose (*A. ægyptiaca*) which Weigold says he saw a pair of " at a great distance " at Urfa on April 11th ; one *may* be mistaken over birds seen at a great distance and further evidence is desirable before admitting this species to our fauna.

202 Mallard. Anas platyrhyncha.

Anas platyrhyncha, L. (=*boschas* auct). (Syst. Nat. Ed. x, p. 125, 1758 —Sweden).

203. Gadwall. Anas strepera.

Anas strepera, L. (Syst. Nat. Ed. x., p. 125, 1758— Sweden).

204. Pintail. Anas acuta.

Anas acuta, L. (Syst. Nat. Ed. x, p. 126, 1578—Sweden).

205. Wigeon. Anas penelope.

Anas penelope, L. (Syst. Nat. Ed. x, p. 126, 1578—Sweden).

206. Shoveler. Spatula clypeata L

Spatula clypeata, L. (Syst. Nat. Ed. x, p. 124—S. Sweden).

Wild fowl are exceedingly abundant on the rivers, swamps and lakes of Mesopotamia ; the marshes round Kurna, Babylon and the Suweikiyeh marsh, to mention some of the best known, teem in winter with vast flocks of geese and all kinds of ducks, and both reed-girt and open pieces of water are indifferently used. But few arrive before mid-August or early September and the majority come later than this ; most leave in March though in places plenty may yet be seen in April and even into May. On the Adhaim river huge flocks were seen going south during September early in the morning, but this movement ceased by the end of the month.

The Mallard is somewhat unevenly distributed and, as in other places, this is probably due to suitability or otherwise of feeding ground, as it seems to be a more particular duck in this respect than some others ; thus while some found it to be the commonest duck, others reported that it was never very common, for instance in a bag of 100 duck at Nasariyeh only one Mallard figured, while at Ezra's Tomb, Buxton considered it to be the commonest species; of course even in Mesopotamia the Mallard is well able to take care of itself, and this may partly account for its apparent scarcity, as it prefers places where a good look out can be kept, such as the river or the middle of large pieces of water.

If it is doubtful if the Mallard breeds in Mesopotamia, at least there is no certain evidence. The late Captain Thornhill has recorded that he saw it in every month of the year and that it probably breeds ; I questioned him about it (and I know he was too good a *shikari* to have confused it with any other duck)

and he was quite certain about it, though he could give me no positive proof of nesting. Buxton thinks that on Akkarkuf lake on October 12th he saw flappers which " almost certainly belonged to this species ". Some certainly stay very late; a flock of 20 were seen by Logan Home on May 21st, and some appear very early, by July, (Magrath) and a good many by mid-August ; so that it is within the bounds of possibility that some may nest, though futher evidence is desirable.

The Gadwall is another very common and widely distributed duck, but there is nothing particularly noteworthy to say about it. A few are recorded as early as August 1st and some stop late—May 6th, a pair at Feluja, May 15th and 21st small lots seen on Euphrates inundation. There is no evidence at all that it nests.

In places Gadwall make up a large proportion of the bag, 40 and 47 being reported in two bags made in January on the Euphrates inundation.

Three specimens examined : ♂, Sheik Saad, 24-1-17 (P. Z. C. and R. E. C.) ♂ Basra 1-19 (Hobkirk). Amara (P. A. B.).

The Pintail is common enough and appears to arrive and depart with the mass, there being no particularly early and late records ; first seen September 13th and last noted April 13th ; just at the time of departure huge flocks congregate together on the inundations.

The Wigeon is exceedingly abundant and is often seen in winter in great flocks on the marshes round Ezra's Tomb and Amara, etc.; they move off early in March, the last seen was on April 9th ; they arrive late with the main mass, but early ones were noted in August near Baghdad.

The Shoveler is exceedingly common and perhaps the best distributed, as almost any kind of water suits it and thus it may be found in places other ducks would scorn, such as canals, small pools and puddles as well as being found in the marshes, lakes and inundations. It is plentiful by the first or second week in September and a few linger on into May, there being records on May 15th, 17th, 19th ; there is however no suggestion that it breeds.

Being universally distributed and less wary than other ducks it figures largely in the bag in some spots ; 20 or 30 are often got and in two bags of 100 birds, Shovelers formed 90 and 95 per cent., respectively.

An albino was reported by Logan Home.

Three specimens examined : ♀, Samarra, 4-1-18(C. R. P.), Amara (P. A. B.); ♀ Sheik Saad, 24-12-17 (Robinson).

207. Marbled Duck. Anas angustirostris.

Anas angustirostris Ménétr. (Cat. Rais. Caucase, p. 58, 1832—Lenkoran).

The Marbled Duck is a fairly common resident ; it breeds in the vicinity of the Tigris and Euphrates in scrub along the banks to Baghdad and Feluja. It seems to prefer dry situations not far from the river or marshes ; Pitman found a nest, in a *Sueda* bush close to crops, at Hindia Barrage some hundreds of yards from a canal, containing 10 eggs, and fresh eggs were brought in on May 28th and June 9th ; in this locality it was plentiful. Thornhill found several nests below Kut and obtained two hard set clutches of five and six eggs on May 15th and 18th. Tomlinson records it breeding at Ali Gharbi, and Logan Home located a colony near Amara. At Shush and Shushtar it also must nest as breeding birds have been obtained by Cheesman and Tomlinson ; and Watts found it breeding at the former place at the end of May.

Three specimens examined : ♂, Shush, 2-5-17 (P. Z. C. and R. E. C.) ; near Basra (Wood) ; ♂, Amara, 21-4-18 (P. A. B.).

208. Falcated Teal. Anas falcata.

Anas falcata, Georgi (Bemerk. Reise Russ., I, p. 167, 1775—Asiatic Russia).

Thornhill can hardly, I think, have made a mistake when he recorded that a male in full dress was shot on the river at Hanna on March 19th, 1916. Thornhill knew this and other Indian ducks exceedingly well and I personally interrogated him about it, and I do not think there can be any doubt that he was correct in his identification ; it can only be a rare straggler so far west ; it has occurred at least twice in Europe.

209. Common Teal. Querquedula crecca.

Querquedula crecca (L.) (Syst. Nat. Ed. x, p. 125, 1758—Sweden).

The Common Teal is an abundant winter visitor some arriving very early ; large flocks were reported near Baghdad on July 17th, on the Euphrates floods on July 31st and on Suweikiyeh marshes in mid-August. The majority however come in September. It is very widely distributed as it not only frequents marshes and lakes, but also the smallest irrigation canals in bare desert country, flooded fields, etc. Bags of 30 or 40 are often made and a bag of 64 is recorded. Most leave again in mid-March and the last were seen in the second week of April.

Cheesman records that on May 2nd he found Marbled and Common Teal both " evidently breeding " in a rush and willow covered Jheel at Shush ; this is the only evidence at all that this species nests within our limits and the fact requires further confirmation.

Four specimens examined : Amara. (two) (P. A. B.), ♀, Basra, 8-3-17 (Stevens) ; ♂, Samarra, 5-2-18 (C. R. P.).

210. Garganey. Querquedula querquedula.

Querquedula querquedula (L.) (Syst. Nat. Ed. x, p. 126, 1758—Sweden).

The Garganey, though scarce, is fairly well distributed in winter, but is much commoner as a bird of passage in August and September and again in April. Flocks were seen as early as July 17th near Baghdad and as late as May 21st. In the marshes near Hindia Barrage, Pitman clearly identified at close quarters; a flock on June 12th ; Logan Home records seeing them also in June, while Magrath says he caught a duckling on the Suweikiyeh marsh which he presumed to have been of this species, as he saw adults. It is possible therefore that a few remain to nest, though further definite evidence is required.

211. Tufted Duck. Nyroca fuligula.

Nyroca fuligula (L.). (Syst. Nat. Ed. x, p. 128, 1758—Sweden).

212. Common Pochard. Nyroca ferina.

Nyroca ferina (L.). (Syst. Nat. Ed. x, p. 126, 1758—Sweden), "Harra."

213. Red-crested Pochard. Netta rufina.

Netta rufina (Pall). (Reise. Russ. Reichs. App., p. 713, 1773—S. E. Russia).

In the absence of any outstanding early records as we have with the surface feeding ducks, it may be taken that these diving ducks arrive in Mesopotamia later and it is probable that not many are seen before October. These three are widely distributed and common on suitable sheets of water and are often seen resting in flocks on the rivers themselves. Round Amara, Buxton noted that the Tufted was rarer than the Common Pochard, but in other places it appears to be common enough. The bulk of these diving ducks leave in March, but Buxton found that the Common Pochard in the main stayed longer, and both Tufted and this species may be seen up to the second week of April. The Red-crested Pochard is fairly common but hardly as numerous as the other two ; stragglers linger on till the last week in April.

One specimen of each preserved.

214. Scaup. Nyroca marila.

Nyroca marila (L.). (Fauna Suecica, Ed. 2, 1761, p. 39—Lappland).

Zarudny records it as a rare winter visitor to the Karun area. It is not likely that this species, which much prefers salt water in winter, will be found in the Mesopotamian marshes and lakes.

215 White-eyed Pochard. Nyroca nyroca.

Nyroca nyroca (Güld.) (Nov. Comm. Petrop., 14 pt. 1, p. 403, 1770—S. Russia.)

The White-eye must be a common duck in winter but there are hardly any records of it. Logan Home says many were seen and a few shot on the Euphrates inundations, and Zarudny gives it as a winter visitor.

216. Golden Eye. Glaucion clangula.

Glaucion clangula (L.). (Syst. Nat. Ed. x, p. 125, 1758—Sweden).

This is not a common duck ; occasional birds are to be seen frequenting the rivers, singly or quite a small party together ; Ludlow saw a flock and shot one at Hit ; Thornhill obtained a male at Hanna on March 20th and there are odd records from the Tigris, Euphrates and Shat-al-Arab.

217. Smew. Mergus albellus.

Mergus albellus (L.). (Syst. Nat. Ed. x, p. 129, 1758—Smyrna).

This species too is uncommon ; a few are recorded from the Tigris and Shat-al-Arab in winter, and like the Golden-eye it would seem to prefer the rivers to the lakes ; it occurs singly or in quite small parties. The acuity of vision of these and other species which obtain their living in the waters of the rivers must be very great, as the water is so loaded with silt that to the human eye it appears quite opaque.

Two specimens were obtained near Amara by Cheesman and Bagnall in February and December, and two by Buxton at Amara.

[The Goosander has been recorded as having been seen fairly commonly on the Tigris by Meinertzhagen (Ibis, 1914). No other records of this species are to hand and no specimens have been obtained. The Merganser (*M. serrator*) has been obtained at Bushire but not so far in Mesopotamia.]

218. Stiff-tail Duck. Erismatura leucocephala.

Erismatura leucocephala (Scop.) (Annus. 1, Hist. Nat., p. 65, 1769—N. Italy).

A rare duck in Mesopotamia ; one was obtained by Hobkirk at Gurmat Ali on April 21st ; another near Kut by Thornhill on February 6th and a third on a jheel (Abu Jisra), 70 miles north of Baghdad, on March 23rd, 1920, by Major Chrystall ; possibly one or two others were obtained.

219. Flamingo. Phoenicopterus ruber.

Phœnicopterus ruber antiquorum, Temm. (Man. d'Orn. 2, p. 587, 1820—Europe).

The Flamingo is a not uncommon resident and in some favoured localities it may be said to be abundant, such as in the marshes round Museyib. But almost anywhere where suitable inundations exist some may be seen in any month of the year, the flocks moving about locally according to the varying conditions of the marshes. Doubtless many move away to their nesting haunts in the breeding season, but a good many non-breeding and immature birds remain behind.

According to Cumming it breeds on the Koweit side of the head of the Gulf, whence I believe he obtained from the Arabs many eggs which are now in the Karachi Museum.

The Flamingo is generally distributed throughout our area.

220. Common Heron. Ardea cinerea.

Ardea cinerea cinerea, L. (Syst. Nat. Ed. x, p. 143, 1758—Europe).

The majority of this species are no doubt winter visitors, but a number may be met with during the summer months in suitable places such as the marshes at Museyib, etc. As this heron does not breed in its first year doubtless many of these are non-breeding birds ; though no nests were reported yet it is quite possible some may breed in these extensive swamps, indeed Cumming had eggs brought to him at Fao said to have been taken on the Abdulla Banks ; they may have come from there or perhaps the marshes on the Koweit side ; Logan Home thought it might nest on the cliffs at Tekrit as he saw birds in the vicinity from April to June but no definite evidence was forthcoming. It is common in winter and widely distributed. Probably a certain number are passage migrants as Cheesman saw a flock pass over Shaiba, an oasis well out in the Arabian desert, on September 16th flying S. W. which direction would take them towards the centre of the Arabian continent.

One skin examined : L. Akkarkuf, 12-8-17 (C. R. P.).

221. Purple Heron. Ardea purpurea. "Er Kheawwi."

Ardea purpurea purpurea, L. (Syst. Nat. Ed. xii, p. 236, 1766—East Europe ?)

The Purple Heron is reported in all months of the year as common and it probably is quite resident. We have however no definite information of its nesting and yet one can hardly doubt its doing so with such extensive marshes at hand so eminently suited to its requirements. It is reported as common in the breeding season in the marshes of the Amara-Kurna district and at Museyib. Pitman remarks that this species is not so common as *cinerea*, but where it is found, it swarms ; there are naturally many places where the latter may be found which do not suit the Purple Heron, which likes lakes and swamps with plenty of cover in the way of reeds and rushes.

One bird was found which, in trying to swallow a three-quarter pound fish, had become *hors de combat* through partial suffocation ; however much smaller 'fry' does not come amiss as Buxton found a dragon fly of the genus *Anax* in the gullet of one he shot.

Cumming obtained eggs at Fao which were said, like all his eggs of the *Ardeidæ*, to have been taken near the Abdulla Banks, presumably from the marshes on the Koweit side.

Ten skins examined : ♂ ? , Kurna, June 1916 (F Wall) ; Qalet Saleh, 7-7-17 (Elmhurst) ; L. Akkarkuf, 26-7-17, 26-8-17, 21-8-17 (C. R. P.) ; five, Amara (P. A. B.)

222. Goliath Heron. Ardea goliath cretzschm.

Ardea goliath cretzschm (Ruppel's Atlas Reise n. Afr. Vög., p. 39, 1826).

In the extensive swamps of Mesopotamia this gigantic Heron is not uncommon and evidently resident. It is reported from the marshes that lie between Basra and Kurna, from those near Amara and Kut and round the Euphrates Barrage, while there are odd records from Feluja and Samarra. Sir Percy Cox obtained young ones from the marshes at Kurna and sent them alive to the Bombay Natural History Society. Buxton remarks that in the field this species much more resembles the Purple than the Common Heron.

This is one of those species which Africa may be said to have contributed to the Mesopotamian fauna, it is found throughout tropical Africa outside of which it is only known in Ceylon and parts of eastern India, where it is rare and sporadic, a very curious distribution.

223. Reef Heron. Demiegretta asha.

Demiegretta asha (Sykes). (P. Z. S., 1832, p. 157, W. Coast of India).

The Reef Heron only occurs in our area on the Fao littoral. Armstrong found it fairly common at Fao and had eggs brought to him, said to have been taken on the Khor Abdulla, on May 20th, 1917. Cumming records it as also common there and obtained several birds and received eggs from the Koweit side. In the *Ibis*, 1886, Sharpe records two of these birds obtained by Cumming as *gularis*, the west African bird ; Mr. Kinnear has examined these birds afresh for me in the British Museum and he considers them to be nothing but *asha*. Both blue and white phases of plumage occur and Cumming considered the white to be the juvenile dress, an observation I cannot confirm.

It is a quite resident species and being essentially a salt water bird is not likely to occur inland.

224. Buff-backed Heron. Ardeola ibis.

Ardeola ibis ibis (L.) (Syst. Nat., 1758, p. 144—Egypt).

This Heron does not seem to be very common and its status is rather uncertain ; Cumming thought that it was resident at Fao and says it is supposed to breed near the Abdulla Banks, in the marshes on the Koweit side. All our records relate to the months of March to October so may be it is a summer visitor. Logan Home noted it at Abu Aran in June. Cheesman records that a flock alighted in a cottonfield at Sheik Saad on September 16th and thinks they were on passage ; two, which he obtained there, were the only specimens preserved.

225. Sqacco Heron. Ardeola ralloides. "Mush-'bea Beda."

Ardeola rallöides (Scop). (Annus i, Hist. Nat., p. 88, 1769—Carniola).

The status of this bird requires further investigation ; all our records relate to the months March-September except two, *viz.*, January 6th (Shat-al-Arab) and October 23rd (Ramadi), so that, on the face of it, it would appear to be a summer visitor. From the end of March it is common in suitable places in small flocks of eight to twenty individuals, and some were thought at this period to be migrating, as at Feluja, Basra, etc. On May 19th, Buxton found it at the Hamar lake and shot a specimen with the sexual organs enlarged, but he was told by the Arabs that it does not breed there; on June 5th near Amara he saw plenty ; Pitman too, in the marshes around Museyib met with it commonly in June and July and supposed it was breeding, while near Baghdad it was common in July-August and September ; in many places in August and September it is noted as common. Cumming says it is resident at Fao and is supposed to breed in the marshes on the Koweit side of Fao. It seems therefore likely that the species will be found breeding in the marshes of Mesopotamia, though up to now there is no certain record.

Eight specimens examined : ♂, Hamar Lake, 20-5-18 ; Baghdad, 31-3-18 ; Amara, 14-4-18 (P. A. B.) ; ♂, Nahr Umar, 26-3-18 ; Feluja, 27-3-17 ; near Baghdad, 8-8-17 (C. R. P.) ; ♂, Basra, 19-4-17 (P. Z. C. and R. E. C.) ; Basra (Hobkirk).

I do not think this Heron can become adult at the first spring ; some of these are in adult plumage, others at the same time of year are in immature dress.

Ardeola grayi has been recorded from Bushire ; we have no evidence of it occurring within our area.

226. Little Egret. Egretta garzetta.

Egretta garzetta garzetta (L.) (Syst. Nat. Ed. xii, p. 237, 1766. "In Oriente").

As with several of the Heron tribe, the status of this bird cannot be made out with certainty. Cumming thought it was resident and recorded that it was supposed to breed near the Abdulla Banks. All our records are of small numbers seen in the months of April, August and September which suggests that it is a

passage migrant or possibly a summer visitor whose breeding quarters were not discovered by any observer, quite a possibility when the huge expanse of some of the marshes is remembered.

Pitman records small flocks on passage at Feluja on April 26th and 27th ; the earliest date on which this species was noticed was April 14th and there are several records from the lower Tigris during this month. It was noted again on August 5th and, on and off, till early in September near Baghdad and in other places. Pitman obtained one specimen on August 23rd ; there are two others in the British Museum.

227. Great White Heron. Egretta alba.

Not very common ; there are scattered records from widely separate districts from November to February so that probably it is a winter visitor in small numbers. Logan Home records a pair at Samarra on May 12th. Zarudny gives it as a passage migrant in the Karun area. No specimens were obtained but it probably is the typical race which occurs.

228. Night Heron. Nycticorax nycticorax.

Nycticorax nycticorax nycticorax (L). (Syst. Nat., x, p. 142, 1758—S. Europe).

The status of the Night Heron is not at all clear ; Cumming says it arrives at Fao in October and leaves in May and from other evidence it is quite clear that it is present in winter ; on the other hand there is good proof that in places it nests, so that perhaps at the most it is a local migrant. As elsewhere it seems to have its favourite haunts, so that where it occurs, hundreds may be seen together, whereas over large tracts of country it may not be met with at all. Thus near Qalet Saleh there is a very big roost where thousands come to spend the day in the date palms, and Buxton noted a fair sized roost at Amara in March, otherwise one may say it is generally distributed, though patchily.

Tomlinson records that it breeds at Shustar in June and Logan Home found a colony six miles below Amara where the birds on April 11th were just beginning to build, while at Samarra he saw five or six fully grown young by the river bank on June 12th ; it probably breeds near Museyib, according to Pitman.

Four skins examined : Lake Akkaruf, 18-8-17 (C. R. P.) ; Amara, 12-1-18 (P. Z. C. and R. E. C.) ; Amara, two (P. A. B.).

229. Little Bittern. Ixobrychus minutus. "Moodoo-wacha."

Ixobrychus minutus minutus (L.). (Syst. Nat. Ed. xii, p. 240, 1766—Switzerland).

Though Zarudny gives this species as a passage migrant and winter visitor, it appears from our records that the majority are summer visitors and some perhaps resident all the year. We have very few winter records and it is not until the end of March and early April that it becomes at all numerous. It breeds fairly commonly in lower Mesopotamia at all events, but appears to be commonest in the Basra district to Fao and Shush. Nest building commences in the first week of May or a little earlier and fresh eggs may be found from mid-May to early June. Tomlinson has found eggs as early as May 8th. According to Hobkirk and Logan Home the nests are situated in dense high reeds in the marshes and made of dead reeds and placed about two feet above the water ; an unusual site for a nest was found by the latter observer ; the nest was fifteen feet up in a mulberry tree growing by the water side, it was built of fine twigs and lined with green mulberry leaves, the male was standing on the empty nest on May 4th ; when visited again on the 17th the nest contained seven eggs, a number which was reported on two other occasions, though five or six is more usual ; the female, when incubating, sits very close.

Four specimens examined : ♂, Kamisiyeh, 4-1-17 (Aldworth) ; ♀, Shush, 3-5-17 (P. Z. C. and R. E. C.) ; ♂ ♀, Basra, 22-5-19 (L. Home).

230. Common Bittern. Botaurus stellaris.

Botaurus stellaris stellaris (L.). (Syst. Nat. Ed. x, p. 144, 1758—Sweden).

A winter visitor in small numbers to those lakes and marshes which afford suitably thick cover. In the marshes south of Baghdad it is not very uncommon and found singly as a rule, and usually one or two are flushed when out duck and snipe shooting. The earliest record is September and the latest April 20th and a straggler in May.

Two specimens examined : ♀, Basra, 8-3-17 (Stevens) ; Amara (P. A. B.).

231. White Stork. Ciconia ciconia. "Haji Lug-a-Lug."

Ciconia ciconia ciconia (L.) (Syst. Nat. Ed. x, p. 142, 1758—Sweden).

Common ; partly resident, also a passage migrant ; many no doubt are summer visitors and some spend the winter. To what extent the breeding birds are resident or summer visitors cannot be determined,as Storks may be seen in every month of the year and large numbers pass over Mesopotamia at the times of migration; to the lower parts of the plains it is a winter visitor and passage migrant.

The breeding range of the Stork in Mesopotamia is somewhat curious ; a line drawn from about Babylon on the Euphrates to Baghdad and then across to Mendali in the foot-hills makes the southern limit of the range except that a few nest at Shustar and Shush in Khuzistan (but not Ahwaz) ; to the north of this line every town on both rivers has its colony, and nests on houses,mosques and tall poplars are familiar to all who have been there, even Jonah's tomb at Nineveh is occupied. They start to repair their nests early in the year ; on February 19th at Samarra, and on the 21st at Beled, operations had begun. Nesting is in full swing by April and feathered young were noted in June. After the breeding season they collect in the neighbourhood in vast flocks preparatory to migrating or scattering further afield in the country, and so, from the end of July onwards, Storks may be seen in those parts where they do not breed. From mid-September till the end of October they are common and well distributed throughout the country and during this period large flocks may be seen passing, circling round and round at a great height, drifting south before the wind, doubtless migrants from further north. In winter it is scarce, but some may be met with in favoured spots all the winter in many different places. Spring migration starts early and begins fairly regularly in the middle of February and lasts through March and up to the first week in April during which time they become common again and frequent flocks may be seen going over north or north-west.

The migrations of the Storks are well known to the Arabs who suppose that they go on an annual pilgrimage to Mecca and are accordingly venerated by them for this, and because they select mosques for building their nests on, hence their title of " Haji." So much are they respected that when the question arose as to whether the golden tiles on the mosque at Samarra should be repaired the idea was abandoned as it entailed disturbing the Stork's nest, until someone suggested that as " Haji Lug-a-lug " was away at Mecca the nest was, for the time being, not required and so the repairs might be undertaken !!

Unlike some other species of birds, the flocks of these birds were not at all disturbed by aeroplanes flying close to them. The curious breeding distribution seems inexplicable, it cannot be on account of climate, or lack of suitable towns, as these exist at Sera, Baghela, Kut, etc., and Sera is no great distance from Kerbela where it nests and both are about equidistant from Baghdad. It has been suggested that they have remained from time immemorial on the sites of ancient cities which formed their breeding quarters when lower Mesopotamia was under the sea, but were this so Nasariyeh, Ahwaz, etc., should have their nesting colonies. It has been reported as breeding at Fao (Cumming) and at Old Basra (Stoneham) on hear-say evidence ; our latest information is that it does not breed at Fao now.

232. Black Stork. Ciconia nigra.

Ciconia nigra (L.). (Syst. Nat. Ed. x, p. 142.—N. Europe).

Apparently a rather rare winter visitor; Cumming obtained one at Fao on September 5th, Magrath saw it near Amara on May 20th and there are a few records in winter.

233. Spoonbill. Platalea leucorodia.

Platalea leucorodia major, Tem. and Schl. (Faun. Jap. Av. p. 119, 1849—Japan).

The Spoonbill is either resident, or perhaps a summer visitor to Mesopotamia as we have no records between November 1st and the end of March. It is common in the marshes of the Euphrates and Tigris moving about locally as its food supply directs. A good many flocks are recorded in these marshes during the breeding season and it may possibly breed there; it certainly breeds somewhere as Cumming had a number of eggs brought him at Fao *said* to have come from Khor Moosa and the Abdulla Banks whence Armstrong also obtained eggs on May 20th.

No specimens were obtained, but those Cumming got at Fao were examined by Mr. Ogilvie Grant and were referred to this larger eastern race.

234. Glossy Ibis. Plegadis falcinellus. "Slinder."

Plegadis falcinellus falcinellus (L.) (Syst. Nat. Ed. xii, p. 24, 1766—Austria).

The status of this species is obscure and records are not very numerous; perhaps it is resident. Near Amara Buxton noted it in February, April, May and August and says it probably breeds. It is recorded in fair numbers at Kurna in January. It is noted as common near Baghdad from July to September and Magrath found it common in the Suweikiyeh marsh in August where it was "evidently breeding."

Buxton obtained one skin.

235. Red-cheeked Ibis. Comatibis emerita.

Comatibis emerita (L.) (Syst. Nat. Ed. x, p. 118, 1758—Switzerland).

It would seem that this Ibis is but a straggler to our part of Mesopotamia; Logan Home saw a few near Tekrit in February and thought it might breed in the Fatah Gorge cliffs or in the higher rocky hills of the Jebel Hamrin, but there is no evidence that it does so. Cheesman who went all over the Fatah Gorge in the breeding season and was at Tekrit in every month of the year failed to find it; however one was shot at Tekrit by Aldworth. There is of course a very well known colony at Beredjik consisting, so Weigold estimated in 1912, of a thousand, whence they wander out to other places, such as Bambudj, fifty miles south.

One was brought home alive to the Zoo from Beredjik by Capt. E. H. Buxton. The bird is considered sacred by the Arabs.

336. White Ibis. Threskiornis æthiopicus.

Threskiornis æthiopicus (Lath.) (Ind. Orn. ii., p. 706, 1790—Africa).

White Ibises certainly occur and not very uncommonly in the district from Amara to Fao; but there are no records from Baghdad and northwards. All records relate to the winter months and to small flocks seen, except that Logan Home records them paired off in Amara marshes but gives no date. Cumming says they are plentiful and Fao in winter and obtained one there on October 25th (recorded as *melanocephala*, Ibis. 1891, p. 113). Hartert (Vog. Pal. Faun., p. 1226) states that the Sacred Ibis (*Th. aethiopicus*) occurs at Fao and Zarudny mentions it (J. F. O., 1911, p. 231) as a very rare vagrant to the South Caspian region. Mr. Kinnear therefore has been kind enough to hunt up Cumming's bird

in the British Museum and he tells me that it has been incorrectly identified as the Indian bird, *melanocephala*, and is undoubtedly an example of the African bird—the Sacred Ibis—*Th. æthiopica*.

237. Common Crane Megalornis grus.

Megalornis grus (L.) (Syst. Nat. Ed. x, p. 141, 1758—Sweden).

The Common Crane is a not uncommon winter visitor and probably a fair number pass through on passage for quarters further south. It seems to be generally distributed in the marshes. No specimens were obtained.

238. Demoiselle Crane. Anthropoides virgo.

Anthropoides virgo (L.) (Syst. Nat. Ed. x, p. 141, 1758—N. Africa).

There are few records of this Crane ; probably the status is much like that of the Common Crane but fewer in numbers.

239. Great Bustard. Otis tarda.

The Great Bustard is almost confined to the rolling plains in the north of our area ; Meinertzhagen records that it was not uncommon round Mosul in January 1914, where he saw droves of seven and fifteen birds. Thornhill saw seven near Wadi early in March 1916.

There are somewhat vague and uncertain records of the bird from Kut and Feluja, but Watts saw a flocks of six, a day's march from Amara ; Weigold saw two near Urfa in April and Egerton obtained one at Kizil Robat.

Exact status unknown. No specimens examined.

240. Little Bustard. Otis tetrax.

The status of this bird is quite unknown, Tristram met with it at Urfa in 1881 and it occurs over the Syrian boundary in that region. It was vaguely reported in several places in lower Mesopotamia, but the only record which seems certain is of a bird seen near Shush by Watts, and reported to me by Ludlow, who described the characteristic " butterfly" flight. Cumming relates that he once shot a smaller Bustard than the Houbara at Bushire and obtained another like it on board ship at Fao ; probably they were of this species although they were never satisfactorily identified.

Zarudny says this Bustard occurs in the Karun district where also the Florican (*Sypheotis auritus*) is an accidental wanderer.

241. Houbara. Chlamydotis undulata.

Chlamydotis undulata macqueeni (Gray). (Ill. Ind. Zool., ii, 1834—India).

The Houbara is pretty common in suitable places throughout Mesopotamia and is resident, or at the most a local migrant. It is, of course, a bird of grassy plains and desert country in which there is a certain amount of scrub. In the Samarra-Tekrit district it is common, occurring in parties of three to ten, sometimes singly, and it is reported as fairly common from Hit downwards on the Euphrates and as far as Kut on the Tigris; below this it is rather less numerous, no doubt due to suitable ground being less extensive. In the foothills it is common again at Mendali, Shush, Bund-i-Kir and doubtless elsewhere and it inhabits suitable parts of the Arabian desert on the west side of the river. According to Mr. Philby it is common in the Hinterland of Arabia and breeds freely there.

Logan Home and Aldworth found two nests on May 5th in the Samarra district and another on May 19th on the grassy plains near the river ; the nests contained one, two and three eggs respectively, those taken on the 19th being very far incubated. Pitman reports it breeding in May and June on the plain between Baghdad and Museyib, and it evidently nests round Kut, Rumailah and doubtless in many other localities. There are eggs in the British Museum from Koweit

(Cumming), Zobeir (Marshall) and Diz, April 25th (Douglas). In the Bombay Museum there is an egg taken in March by Capt. Wilson in lat. 33° (south of Baghdad).

One skin examined : ♂, 25-10-18, Samarra (P. Z. C. and R. E. C.).

242. Stone Curlew. Burhinus œdicnemus.

1. *Burhinus œdicnemus saharœ.* (Rchw.) (J. f. O., 1894, p. 102—Tunis).
2. *Burhinus œdicnemus astutus.* Hart. (Nov. Zool., 1916, p. 93—Fao).

The Stone Curlew is fairly common in suitable places and both the above races occur. Unfortunately the collections do not contain any breeding birds and so the status of the two races cannot be made out, but Stone Curlew are to be found throughout the year and breed in the country. Logan Home noted it as common on the shingle islands along the river at Samarra on June 15th, the birds were paired and were courting; it is also found all up the river to Tekrit, he also saw it at Shaiba in May and June. Pitman noted quite large flocks of twenty to a hundred individuals in the Adhaim area from September to November, they spent the day in the scrub and flighted out to the plains at night, at which time they were very noisy; specimens which he obtained at that time I refer to *saharœ*. On August 1st Buxton found Stone Curlews common in the stony desert at Khanikin whence they flighted to the valleys at sundown, one he obtained there is certainly *astutus* and the date is early enough to suggest that it was a breeding bird of the district; on the other hand Pitman obtained a specimen of *saharae* at Lake Akkarkuf on August 21st. It would be very remarkable if both these forms breed in the same area, possibly one is a hill form and comes to the plains early in autumn and the other is resident in the plains. Further investigation is required on this point and some breeding birds from different areas are essential.

Pitman obtained incubated eggs in the flat open country near R. Hai near Kut on June 15th and two stale incubated eggs on May 20th near the Es Sinn position. Stoncham says that this bird is quite good eating.

(1) L. Akkarkuf, 21-8-17; Adhaim, 27-9-17, 9-10-17 (two) (C. R. P.); ♀, Shustar, 2-1-18 (F. M. B.); Frontier of Arabistan, 1916 (W).; wing, 232-250, bill (base) 41·5-43 mm.

(2) ♀, Khanikin, 1-8-18; wing 243 (P. A. B.); ♂, Sheik Saad, 3-10-16; wing 246, bill (base) 43·5 mm. (P. Z. C. and R. E. C.); also a specimen from Fao in the British Museum.

243. Cream-coloured Courser. Cursorius gallicus.

Cursorius gallicus gallicus (Gm.) (Syst. Nat. i, pt. 2, p. 692, 1789—France).

Without being called a rare bird the Courser, except perhaps in a few places, cannot be said to be common, and is rather local; though no nests were found it undoubtedly breeds and is resident.

Though found in the bare flat mud desert it would seem to prefer the sandier and more pebbly parts, such as the edge of the Arabian desert on the west of the Euphrates and in the Adhaim area, and the former district at any rate no doubt forms its chief breeding grounds, where Logan Home saw plenty in the breeding season and a family party of old and young were met with on May 25th at Shaiba; at Chunabdah in the same area and near Hindia barrage it was also reported in the breeding season, while Magrath notes it at Kut in July. A good deal of local migration probably takes place in the autumn. Buxton says that some he met with in clay desert, when the sun was low and casting a heavy shadow, were most conspicuous.

The young of the year moult their body-plumage and tails in the autumn, as with other Limicoline birds.

Five specimens examined : Amara, 17-12-17 ; ♂, juv. Basra, 19-8-17 (P. A. B.) ; Amara, 2-12-17, juv. Shaiba, 12-8-18. (P. Z. C. and R. E. C.) ; Basra, 8-9-19 (L. Home).

These appear to me to be quite typical, wings 160-166 mm.

244. Common Pratincole. Glareola pratincola.

Glareola pratincola pratincola (L.). (Syst. Nat. Ed. xii, p. 345, 1766—Austria).

The Pratincole is a summer visitor and locally abundant. It arrives in the last days of March and by the end of the first week in April it is numerous in the areas in which it intends to breed.

There are many colonies dotted about in our area of which a few may be mentioned ; it breeds at Feluja ; on the drying edges of Lake Akkarkuf ; near Museyib ; at Chaldari, near Baghdad ; Samarra ; Suweikiyeh marsh ; Abu Aran ; near Fao ; and Ahwaz. The drying edges of marshes and inundations are favourite sites for colonies, the eggs being deposited in some depression such as a hoof mark in the dry hard mud ; at Samarra they were nesting on shingle on the edge of the river and at Ahwaz on sandy islands in the Karun below the rapids. At Chaldari and Sera, Cheesman found colonies on hard bare sun-baked desert some miles from the river.

Fresh eggs may be obtained at the end of April. Few birds are more demonstrative when they have young about than this species ; Cheesman says that on invading a colony, there were birds on the ground in all directions with drooping flapping wings, feigning disablement ; while Pitman, who witnessed the same performance, notes that in some lights the effect was very curious and that the display to draw off attention gave the appearance of a snake coiling about or a big lizard moving along ! !

Buxton noted that birds flying over a recently dried marsh at Amara were nearly out of gunshot but two birds then obtained had their mouths full of small " water-boatmen " (*Corixidæ* and *Notonectidæ*) which must have been flying at that altitude in bright sunshine. Others, which Cheesman examined, contained *Coleoptera* and Locust remains. Stoncham says they may be seen feeding on *Termites* after rain.

The Pratincole probably departs in August, the latest record is September 3rd.

Nine skins examined : ♂, Amara, 15-5-18 ; ♂, ♀, 7-4-18 (P. A. B.) ; ♂ ♀, Ahwaz, 30-4-17 ; ♂ ♀, Sera, 2-5-19 ; ♀, Baghdad, 12-5-19 (P. Z. C. and R. E. C.) ; Feluja, 15-4-17, (two) (C. R. P.).

These appear to me to be quite typical.

245. Black-winged Pratincole. Glareola nordmanni.

Glareola nordmanni, Fischer. (Bull. Soc. Imp. Nat. Moscow, xv, 1842, p. 314—S. Russia).

There is little to record about this species. Pitman shot two at Feluja on April 15th and saw them there and between there and Baghdad in May, where they were evidently breeding, as also at Hindia barrage. At the end of July and beginning of August he met with some on L. Akkarkuf. They were nowhere plentiful and were apparently breeding in the same colonies as the common species. The two birds obtained had their crops crammed with half grown locusts.

246. Red-necked Phalarope. Phalaropus lobatus.

Phalaropus lobatus (L.). (Syst. Nat. Ed., x, p. 148, 1758—Hudson Bay) (=*hyperboreus*, auct.).

Zarudny gives this Phalarope as a passage migrant and winter visitor. It may occur, though I never saw it, in the sea off Fao in winter, and might be found on passage in the marshes of our area.

247 Woodcock. Scolopax rusticola.

Scolopax rusticola (L.). (Syst. Nat. Ed., x, p. 146, 1758—Sweden).

The country being unsuited to this bird's requirements, it is only a rare or perhaps occasional winter visitor. In different years there are six records of it at Basra from November to February ; Aldworth obtained one at Tekrit in high crops on November 11th, 1918 ; and Thornhill records one at Kut on October 6th, 1916. In January and February 1918 they were said to have been " rather plentiful " in suitable places on the Diala river in the foothills district. It was met with also at Ahwaz.

248. Common Snipe. Gallinago gallinago. " Jehalul " or "Naja el Maya."

Gallinago gallinago gallinago (L.). (Syst. Nat. Ed. x, p. 147, 1758—Sweden).

Common winter visitor, abundant in suitable marshes. The first may be seen as early as August 3rd, quite a few by the middle of the month, but the bulk do not arrive till later. Plenty are still present in mid-April, most have gone by early May and stragglers are noted at the end of that month. There is no evidence that any remain to breed, Pitman found it absent from the marshes in the Museyib district in June and July. The Arabic name " Nāja-el-Māya " means " water-goat ", evidently in reference to the drumming sound which, though constantly heard in the breeding season, may also sometimes be heard in the winter.

In favourable localities a couple of guns may easily obtain 40 to 50 couple in a day.

Three skins examined : ♀, Amara, 7-4-18 (P. A. B.) ; Samarra, 6-3-18 (C. R. P). ♀, Sheik Saad, 26-1-18 (Robinson).

Zarudny gives *raddei* also as a winter visitor ; I am unable to recognize this race.

249. Great Snipe. Gallinago media.

Gallinago media (Lath.). (Gen. Synop. Supp., i, 1787, p. 292—England).

Our records tend to show that this species is a passage migrant, though Zarudny records it in winter also. Thornhill records it at Haibi in April where a small patch of wheat and flooded grass seemed full of them. Cumming met with it at Fao in April and Buxton got one at Amara on April 14th ; it is also recorded from Shush in spring ; Logan Home met with single birds near Basra on August 3rd and 29th, and Connor obtained one there on September 16th.

250. Jack Snipe. Limnocryptes gallinula.

Limnocryptes gallinula (L). (Syst. Nat. Ed., xii, p. 244, 1766—France).

Generally distributed in winter in suitable localities throughout our area and common ; time of arrival was not noted, it was still common at the end of the first week in April.

251. Broad-billed Sandpiper. Limicola falcinellus.

Limicola falcinellus (Pont.) (Danske Atlas, 1, 1763, p. 623—Denmark).

Cumming obtained several at Fao in August and September where it must be common. We have no further records.

252. Terek Sandpiper. Terekia cinerea.

Terekia cinerea (Guld.) (Nov. Comm. Petrop., xix, 1775, p. 473—Terek River, S. E. Russia).

Probably common at Fao on the tidal mud flats where Cumming obtained several at the end of August and early in September. Essentially a maritime wader in winter.

253. Little Stint. Erolia minuta.

Erolia minuta minuta (Leisl.) (Nach. zu Bechst. Naturg. Deutsch., 1812 p. 74—Hanau, Germany).

Buxton found this species abundant on spring and autumn passage in the marshes Magrath and Meinertzhagen noted small parties along the rivers in winter.

Exact status not fully known, probably a winter visitor and a passage migrant, as Zarudny states.

Four specimens examined : ♂ ♀, Akkarkuf, 6-10-17 ; ♂, Amara, 7-4-18 ; ♂, Baghdad, 21-9-17 (P. A. B.).

254. Temminck's Stint. Erolia temmincki.

Erolia temmincki (Leisl.) (*t. c. supra*, p. 78).

Winter visitor, fairly common in the inundations and along the rivers in suitable places. Some are probably passage migrants also.

Five specimens examined : Samarra, 8-2-18. ; Akkarkuf, 16-8-17 (C. R. P.); ♀, Amara, 24-3-18 ; ♂, 5-10-17 ; one, 30-12-17 (P. A. B.)

255. Dunlin. Erolia alpina.

Erolia alpina alpina (L.) (Syst. Nat. 1758, p. 149—Lappland).

Common winter visitor, arrives early in August and remains till the middle of May. Apparently some remain all the summer as non-breeding birds, as Logan Home saw " many " at Ratawi on June 19th.

Dunlins frequent edges of inundations, flooded fields, river banks, associating with Stints.

Three specimens examined : Amara, 25-1-18 ; Sheik Saad, 18-12-16 (P. Z. C. and R. E. C.) ; Samarra, 24-12-17 (C. R. P.) ; four, Amara, Jan.-April (P. A. B.).

These belong to the typical race, with bills 32-27 mm., wings 116-119 mm., which in my opinion extends east to western Siberia. I have already pointed out (Bull. B. O. C., xxxiii, p. 99) that there is not sufficient difference between birds from Lappland and West Siberia to warrant the distinguishing of a separate race from the latter locality, so far as present material is available. Hartert (Vog. Pal. Faun., p. 1576) recognises this race from Siberia doubtfully and lists it as ? *Erolia alpina pusilla*. Falk. 1786. If *Tringa* is used for the Stints, as is done in the B. O. U. list, then *pusilla* cannot be used for this race even if it were recognisable as it is not the *Tringa pusilla* of Linnæus, 1776.

256. Curlew Sandpiper. Erolia ferruginea.

Erolia ferruginea (Brün.) (Orn. Bor., 1764, p. 53—Iceland) (=*subarquata* auct.)

Meinertzhagen and Zarudny both record the Curlew Sandpiper in winter ; Buxton obtained examples at Amara in December and April ; probably it is a winter visitor and passage migrant.

[The Knot is recorded from the backwaters of the Tigris near Baiji, but as no skins were obtained and there are no other records for Mesopotamia I omit it. It would be interesting to confirm that this species winters on fresh water and so far inland, as I certainly do not think it is usual.]

257. Sanderling. Calidris arenaria.

Calidris arenaria (L.) (Syst. Nat. Ed., xii, p. 251, 1766—England).

Zarudny lists the Sanderling as a winter visitor, presumably to the head of the Gulf littoral. Probably common there.

258. Ruff. Machetes pugnax.

Machetes pugnax (L.) (Syst. Nat. Ed. I., x, p. 148, 1758—Sweden).

Status doubtful and there are few records. Pitman found a few on L. Akkarkuf early in September, Livesay saw many on the Euphrates marshes on May 15th. Zarudny says it is a winter visitor to the Karun district, and Neumann records it from Ras-el-ain on February 14th. Stoneham notes it at Ctesiphon on March 22nd and Ludlow at Ahwaz on the 29th. Probably a not uncommon winter visitor and passage migrant.

One skin examined : L. Akkarkuf, 2-9-17 (C. R. P.).

259. Redshank. Totanus totanus.

Totanus totanus totanus (L.) (Syst. Nat. Ed., x, p. 145, 1758—Sweden).

Common winter visitor and generally distributed. It arrives at the end of July, but most come back in the middle of August and it is recorded up to the end of May, though most have gone a week or two earlier. Magrath records that he heard it near Amara on June 29th, so perhaps some non-breeders spend the summer.

Four skins examined : Samarra, 22-1-18 ; 25-12-17 (C. R. P.) ; ♀, Basra, 3-1-19 (Armstrong) ; ♀ Amara, 30-12-17 (P. A. B.).

Not distinguishable from W. European examples.

260. Spotted Redshank. Totanus maculatus.

Totanus maculatus (Tunst.) (Orn. Brit., 1771—England).

Zarudny records this as a winter visitor to the Karun district and Stoneham noted it at Samarra on May 17th. It is recorded from Biredjik by Weigold on May 1st and Ludlow shot two near Ahwaz in March. Probably it is commoner than the above records indicate.

261. Marsh Sandpiper. Totanus stagnatilis.

Totanus stagnatilis Bechst (Orn. Taschenb., ii., 1803, p. 292—Germany).

Probably a not uncommon winter visitor ; recorded by Zarudny, and Buxton obtained one at Baghdad on March 13th.

262. Greenshank. Totanus nebularius.

Totanus nebularius (Gunn.) (Leem. Beskr. Finm Lapp. 1767, p. 251—Norway).

Fairly common winter visitor: some arrive at the end of July; most of them in August ; leaves at the end of April.

Two skins examined : ♀, Azizieh, 16-10-08 (P. Z. C. and R. E. C.) ; ♀, Baghdad, 26-9-17 (P. A. B.).

263. Common Sandpiper. Tringa hypoleucos.

Tringa hypoleucos (L.) (Syst. Nat., 1758, p. 149—Sweden).

A winter visitor generally distributed on the rivers and canals but commoner as a passage migrant. It apparently arrives as early as mid-July and it is recorded as leaving about the middle of May. Tomlinson says it is resident at Basra and " immature birds were seen in the summer " but this does not necessarily prove that it breeds in Mesopotamia. Pitman too thought he saw it in the Hindia barrage marshes in June and July. Quite possibly some may spend the summer in their usual winter quarters if they are not going to breed that year.

Four skins examined : ♀, Amara 14-9-18 ; ♀, 14-4-18 (P. A. B.) ; ♂, Ahwaz, 24-5-17 (P. Z. C. and R. E. C.) ; Feluja, 9-4-17 (C. R. P.)

264. Green Sandpiper. Tringa ochropus.

Tringa ochropus, L. (Syst. Nat. Ed. x, p. 149, 1758—Sweden).

265. Wood Sandpiper. Tringa glareola.

Tringa glareola, L. (Syst. Nat., Ed. x, p. 149, 1758—Sweden).

Both Wood and Green Sandpipers are fairly common. They arrive during August and both are recorded up to the middle of May by which time most have gone. Whereas the Green Sandpiper is certainly present all the winter, there are only two records of the Wood Sandpiper after October, odd birds being recorded by Pitman in February and December, so that in the main the latter species is a passage migrant and probably the former to some extent also.

266. Black-tailed Godwit. Limosa limosa.

Limosa limosa (L.) (Syst. Nat. Ed. x, p. 147, 1758—Sweden).

A common winter visitor frequenting the muddy margins of floods, etc. It arrives early in August and probably departs again in April and May. A certain number however spend the summer in the Euphrates marshes, as round Museyib and Ratawi; these of course are non-breeding birds as is the case with many other waders.

Six specimens examined: L. Akkarkuf, 12-8-17; 17-8-17 (C. R. P.); ♀, Baghailah, 11-3-17 (Ingoldby); ♂ ♀, L. Akkarkuf, 10-17; ♂, Amara, 17-2-18 (P. A. B.).

267. Bar-tailed Godwit. Limosa lapponica.

Limosa lapponica (L.) (Syst. Nat. Ed. x, p. 147, 1758—Lappland).

Recorded by Pitman from the mud banks of the Shat-al-Arab in January. It is probably common there.

268 Common Curlew. Numenius arquata.

Numenius arquata (L.) (Syst. Nat. Ed. x, p. 145, 1758—Sweden).

Common as a winter visitor and also as a passage migrant. Cumming says it arrives at Fao in July and leaves in March. Pitman records it as first seen in the Hindia marshes on July 10th, and huge flocks were passing over to the south-east during the first week in August near Baghdad. On the return passage he noted large flocks frequently from mid-April to May 25th at Feluja going north-east in the evenings.

It is equally at home on the floods and marshes as on the foreshore at Fao.

One skin: ♀, Amara, 8-1-18 (P. Z. C. and R. E. C.).

269. Whimbrel. Numenius phæopus.

Numenius phæopus (L.) (Syst. Nat. Ed. x, p. 146, 1758—Sweden).

Common passage migrant, arrives in July and August and the passage lasts till the end of September. Passes through again in April and May. Some may overwinter as Cumming records it as a winter visitor to Fao, and odd ones may pass the summer since Magrath records it from near Amara on June 30th.

270. Slender-billed Curlew. Numenius tenuirostris.

Numenius tenuirostris, Vieill. (N. Dict. d'Hist. Nat. viii, 1817, p. 302—Egypt).

Status quite unknown. Buxton saw many on December 16th, 1917, in a temporary winter lake in a hollow in the bare desert ten miles north of Amara and secured a specimen. This is the only definite record.

271. Black-winged Stilt. Himantopus himantopus.

Himantopus himantopus (L.) (Syst. Nat. Ed. x, p. 151, 1758—Egypt).

Resident and common in the larger marshes, spreading out in winter to temporary floods, etc. Magrath records that it breeds in the marshes above Amara but was much disturbed by shell fire in 1916.

Numbers breed on the Suweikiyeh marsh, some breed near Basra, and Pitman found it breeding plentifully in the Hindia and Museyib marshes. The first nest he found was on May 31st containing three incubated eggs; the nest was

just a hollow in spongy ground ; he found many more nests between June 2nd and 12th and all these nests were on mud mounds well above the general level and well out on the marsh ; the birds had apparently constructed these mounds themselves ; three or four eggs were the usual full clutch and the eggs varied very much in colour and markings. See plate.

Five specimens examined : L. Akkarkuf, 18-7-17 (C. R. P.) ; Amara, 24-1-18 (P. Z. C. and R. E. C.) ; ♂, Amara, 16-6-18 ; ♀, 24-3-18 ; ♂, Shahroban, 30-7-18 (P. A. B.).

272. Avocet. Recurvirostris avocetta.

Recurvirostris avocetta (L.) (Syst. Nat. Ed. x, p. 151, 1758—Sweden).

The Avocet is not very common but is resident and breeds. Quite small parties or single birds may be met with in the non-breeding season almost anywhere on the rivers and marshes. The only district that there are any records of its breeding in is Museyib where, on the west side of the Euphrates, Pitman found it nesting and on June 3rd took a nest of four eggs ; the nest was just a depression in the ground on the edge of a marsh with a little grass material as lining ; he also saw a few on L. Akkarkuf in July which he thought had bred there.

There are eggs in the British Museum labelled " Mesopotamia."

Four skins examined : ♂, Amara, 1-1-18 (two) (P. A. B.) ; ♂, Amara, 8-1-18 (P.Z.C. and R. E. C.).

273. Golden Plover. Pluvialis apricarius (=pluvialis, auct.).

Pluvialis apricarius (=*pluvialis*, auct.) (L.) (Syst. Nat. Ed. x, p. 150, 1758—Sweden).

274. Asiatic Golden Plover. Pluvialis dominicus.

Pluvialis dominicus fulvus (Gm.) (Syst. Nat. i, pt. 2, 1789, p. 687—Tahiti).

The Golden Plover is recorded as a winter visitor and the Asiatic bird as a passage migrant by Zarudny in the Karun district.

We have no records of the former, but Capt. Hanna obtained three of the latter near Sheik Saad on January 21st, 1921, as he informs me.

275. Grey Plover. Squatarola squatarola.

Squatarola squatarola (L.) (Syst. Nat. Ed. x, p. 149, 1758—Sweden).

Cumming obtained this species at Fao in September and October where it is probably a common winter visitor.

276. Common Ringed Plover. Charadrius hiaticula.

Charadrius hiaticula tundræ (Lowe). (Bull B. O. C., 36, p. 7, 1915—Yenisei).

Some records of the Little Ringed Plover may refer to this species as most observers were not aware that both occur, or simply entered their records as " Ringed Plover." The status of this bird is therefore doubtful, but it must be either a winter visitor or a passage migrant ; Zarudny lists it as both. Buxton obtained two young examples on L. Akkarkuf on September 26th and October 6th where it is not uncommon. These have black bills and dull ochre-coloured legs and feet ; a male measures in wing 123 mm. and an unsexed bird 127mm. From their small size and the darkness of the mantle I refer them to the Siberian race described by Lowe, though I am not quite certain that his name can stand. Mr. Schiöler (*Dansk Orn. F. Tids.*, 1915, p. 177-9), has gone very fully into the question of this race and its name, and considers that Ménétriès name *intermedius* should be used, but as this name is not quite clearly referable to this bird, it is perhaps better to drop it, as should be done with most doubtful names.

277. Little Ringed Plover. Charadrius dubius. "Dah rooj."

Charadrius dubius curonicus, Gm. (Syst. Nat. T. p. 692—"Curonia").

Common and resident through the length and breadth of our area moving about locally after the breeding season; there is no evidence of any influx in autumn of winter visitors. Pitman found it nesting in the Euphrates marshes near Museyib on June 3rd. Logan Home met with it breeding on the river above Samarra and found several nests containing four eggs between May 21st and June 2nd. Cheesman found them just beginning to breed on the pebbly banks at Baiji in April. It probably breeds at Feluja, L. Akkarkuf, Nahr Umar and many other places. In winter it is frequently seen along the foreshore of the rivers and sides of canals as well as on the inundations and is perhaps the commonest and most widely distributed small wader.

Eight specimens examined: Baghdad, 8-10-17, 5-10-17; Khanikin, 1-8-18 (P.A.B.); Feluja, 21-3-17, 7-4-17 Samarra, 8-3-18; Baghdad, 18-8-17 (C. R. P.); Fatah Gorge, 18-4-19 (P. Z. C. and R. E. C.).

The wings of these birds measure 109·5-120 mm. and bills from edge of forehead feathers 12·5-13·5 mm.

278. Large Sand Plover. Charadrius leschenaultii, Less. **(=geoffroyi auct.).**

Charadrius leschenaultii, Less. (=*geoffroyi* auct.) (Dict. Sci. Nat. XLII, p. 36, 1826—Pondicherry, India).

Common at Fao where Butcher and Cumming obtained several specimens in August, February and March and where I saw a flock on March 16th.

279. Kentish Plover. Charadrius alexandrinus.

Charadrius alexandrinus alexandrinus L. (Syst. Nat., 1758, p. 150—Egypt).

The Kentish Plover is pretty common and resident throughout our area. It particularly affects the drying edges of temporary marshes and such situations are favourite nesting sites. The breeding season lasts from the end of April till the end of June; Ludlow records finding several nests at Ahwaz on April 29th. At Abu Aran, above Kurna, Logan Home found several nests in June on small sandy islets in a reed grown marsh, where also Little Terns, Pratincoles and White-tailed Lapwings were nesting. Buxton and Evans found nests at Amara on May 26th and June 5th on sandy ridges on a dried up piece of marsh; the nests were lined with a few bents and quite a number of shells which the birds had been at pains to gather, as Buxton noted that they were not common. It breeds round Basra, at the Suweikiyeh marsh and doubtless many other places.

Two specimens examined: ♀, Amara, 22-1-18, wing 109, bill 15 (P. A. B.); ♀, Sheik Saad, 18-12-16, wing 109·5, bill 15·25 mm. (P. Z. C. and R. E. C.). These both belong to the typical race.

280. Caspian Plover. Charadrius asiatica.

Charadrius asiatica asiataca, Pall. (Reise Russ. Reichs ii, 1773, p. 715—S. Tartary).

Common, but rather local, on spring and autumn passages. Pitman saw flocks of thousands on the fertile plain on the left bank of the Tigris from Kut to Azizieh in the first week of March, and on the 19th he saw a flock on cultivation at Feluja. Cheesman found it plentiful feeding round gardens on desert land at Sheik Saad on March 26th. Cumming obtained a young one at Fao on August 11th, while Pitman saw a large flock on a semi-cultivated plain near Samarra on November 18th.

Five specimens examined: ♂, Sheik Saad, 21-3-17, 25-3-17; ♀, 25-3-17 (P. Z. C. and R. E. C.); Kut, 2-3-17 (two) (C. R. P.).

All are in breeding dress except one ; they are finishing or have finished a body moult which seems to be complete below, but only partial on the upper parts where many feathers are worn and, as no new ones are coming through, these perhaps will be retained for the summer. The odd bird is in winter dress still.

281. Dotterel. Eudromias morinellus.

Eudromias morinellus (L.). (Syst. Nat. 71758, p. 150—Sweden).

A common but local winter visitor. Pitman noted it as common on the undulating wastes covered with grass near Samarra during the winter, where it occurred in vast flocks. It is reported as plentiful at Feluja and common in the Karun district. Elsewhere it occurs according to our records sparsely and in quite small numbers. Last record April 7th.

Seven skins examined : Arab village, 3-12-16 (P. Z. C. and R. E. C.); Feluja, 11-4-17 Samarra, 20-1-18 (C. R. P.) ; Amara, 16-12-17 (P. A. B.) ; Feluja, 1-11-17 (Ludlow) ; ♂ Khamisiyeh, 24-11-16 (Aldworth) ; Ramadie, 16-11-18 (Brooking).

282. Sociable Lapwing. Chettusia gregaria.

Chettusia gregaria (Pall). (Reise. Russ Reichs I, 1771, p. 456—S. E. Russia).

This species is a winter visitor and like the two previous Plovers it is very local, but where it occurs at all, good numbers may be met with. Logan Home recorded it in large flocks on the Tekrit uplands from October to February and Pitman met with it plentifully in huge flocks on the cultivated plain between Kut and Azizieh at the end of February. Cheesman found flocks on the desert near Tel-al-lahm 20 miles from the river. It is recorded from Basra, Ezra's Tomb, Urfa district and Ras-el-Ain. The latest record was on April 4th. Like the two previous species this bird prefers cultivated land and grassy uplands to marshes.

Three specimens examined : ♀, Ezra's Tomb, 3-12-18 ; ♂, Tel-al-lahm, 28-12-18 (two) (P. Z. C. and R. E. C.)

283. White-tailed Lapwing. Chettusia leucura. "Tatwa."

Chettusia leucura (Licht.). (Eversm's Reise v. Oremb. nach Buchara, p. 137, 1823, between Kuwan and Jan-Darja).

Very common resident, breeding round the inundations, temporary and permanent marshes ; in winter spreading further afield and some may even migrate. Unlike the last three Plovers this is a true denizen of the marshes and is never found far from water. The breeding season begins about the second week in May and full clutches are universal early in June. In the Euphrates marshes round Museyib and Hindia Barrage, Pitman came across great numbers of this species nesting in the first week of June. The nests were on the edge of the marsh or on semi-submerged islets, indeed many nests had been flooded out. So numerous were they there that he several times examined 50 to 100 nests in an hour, and a tiny islet might hold three or four nests. He describes the nest as being much like that of the Peewit ; the eggs four in number, vary a good deal in size and markings and are smaller and more clay-coloured than those of the Red-wattled Lapwing. Logan Home, who found a colony at Abu Aran on June 8th, says the nests were on the edges of islands in a marsh and usually 5 to 10 yards from the waters edge. These islands were sandy with small hillocks and patches of short grass here and there on them and were closed in by high reeds all round. The nests were of the usual Plover shape with a few bits of shell under the eggs.

He says that, unlike the Pratincoles and Little Terns which were nesting there, these birds were very wary and would not go on to their nests while he was on the island. Like the Peewit they are very noisy at the nesting ground.

Photo. Capt. W. Edgar Evans, Nov., 1918.

A.—Valley in the Jebel Hamrin, N.E. of Baghdad. Haunt of See-see, &c.

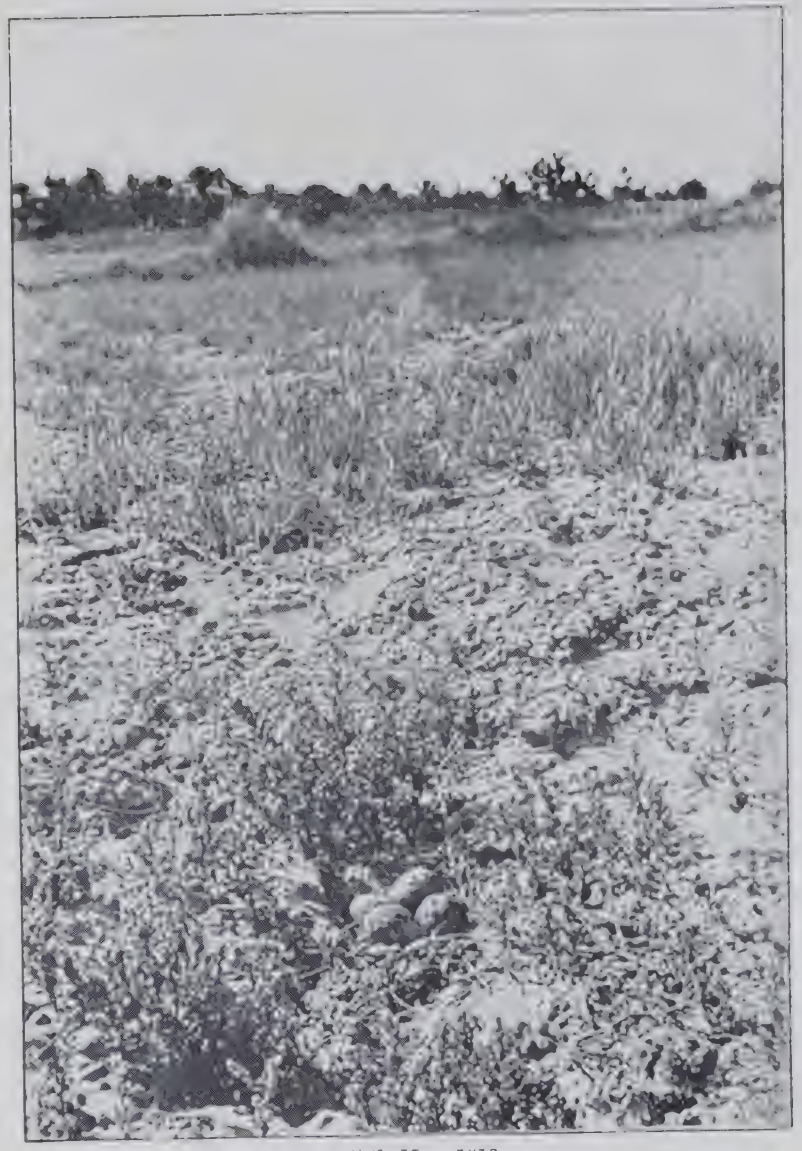


Photo. Capt. W. Edgar Evans, 17th May, 1918.

B.—Nest and 4 eggs of *Chettusia leucura*, near Amara.

Other breeding grounds are the Suweikiyeh marsh, L. Akkarkuf, marshes round Amara, and doubtless many other places.

In the Samarra-Tekrit area where less amount of suitable ground is to be found it is somewhat local and Pitman thought many moved away from that district in winter.

Six specimens examined : Frontier of Arabistan (Wilson) ♀, Hindia Barrage, 22-3-19 (P. Z. C. and R. E. C.) ; ♀, Amara, 30-12-17, (two) ♀ Amara, 26-2-18 (P. A. B.) ; ♂, Basra, 19-3-18 (C. B. T.)

284 Red-wattled Lapwing. Sarcogrammus indicus.

Sarcogrammus indicus aigneri, Laubm. (Falco 9, p. 10. 1913—Las Belas in Beluchistan),

It is of considerable interest to find this Lapwing, which is so common and familiar to everyone in India, has spread westwards along the Mekran and Persian Gulf into Mesopotamia. It is not uncommon, widely distributed and of course resident. Unlike the Indian Roller, which has but a limited distribution in our area, this Lapwing, which can adapt itself to almost any circumstances compatible with a Plover's life, has extended throughout the length and breadth of Mesopotamia; from the Karun and Basra districts it may be traced up the Euphrates to Feluja and up the Tigris to Tekrit, Samarra and Mosul while it is found out on the Persian frontier at Shahroban and Khanikin. The breeding season begins in the middle of April and eggs are reported as late as June 6th. The nest unlike that of the White-tailed Plover is placed " high and dry," generally some little distance from water and is a mere scrape after the fashion of its kind, nor is it colonial in its nesting habits like the last named, each pair jealously guarding its own territory. In winter it is subject to local migrations.

Three specimens examined : ♀ Amara, 1-12-17, wing 229, bill 38 (P.A.B.) ; Sheik Saad, 2-11-16 w. 225·5, B. 36, (P. Z. C. and R. E. C.) ♂, Sheik Saad 14-12-17, w. 233, B. 38 (Robinson).

These are not to be distinguished in any way from Baluchi specimens, whence came the type of *aigneri.*

285. Spur-winged Lapwing. Hoplopterus spinosus.

Hoplopterus spinosus (L.) (Syst. Nat., 1758, p. 151—Egypt).

Zarudny records this as a rare winter visitor to the Karun district. Pitman seems certain he saw some near Kurna in January. Weigold says he saw it apparently breeding at Bambudj and Beredjik just over the Mesopotamian boundary in Syria. The status of this bird in Mesopotamia requires further investigation.

286. Common Lapwing. Vanellus vanellus.

Vanellus vanellus (L). (Syst. Nat. 1758, p. 148—Sweden).

A winter visitor in small numbers and widely distributed throughout our area. It apparently arrives late in the autumn, the first record being on October 22nd and the majority do not arrive till early November. Buxton, who found it common at Amara, noted that it disappeared at the end of February and the latest date we have any record of is March 4th. In some marshes it appears to be pretty common, but most records refer to small flocks or small numbers.

Four specimens examined:—Samarra, 13-12-17 (C. R. P.) ; ♂ Tekrit. 9-12-18 (P. Z. C. and R. E. C.) ; Amara, 27-11-17. 10-12-17 (P. A. B.)

287. Oyster-catcher. Hæmatopus ostralegus.

Hæmatopus ostralegus, L. (Syst. Nat., 1758, p. 152—Sweden).

The Oyster-catcher is not a very common winter visitor ; small parties may be met with on the inundations and mud banks of the Tigris and Euphrates in their lower reaches and it was once recorded as far north as Baghdad ; at Fao

it is probably not uncommon. There are several records of it during the breeding season, but there is no indication that it nests in our area. As it is recorded in nearly every month of the year it is impossible to say what its migratory movements are.

One skin examined : Amara, 16-3-19 (Logan Home).

288. Crab Plover. Dromas ardeola.

Dromas ardeola, Paykull (K. Sevensk. Vet. Ak. Handl. 26. pp. 182-188, 1805—India).

This, essentially a maritime species, is only known in our district in the Fao littoral. Here Cumming obtained specimens in October and eggs from the district. Probably these came from the Khor Abdulla, as Armstrong, while at Fao, ascertained that it breeds there in large numbers and had eggs brought to him on May 20th from there. From the Arab who obtained them Armstrong ascertained the following facts.

The Khor Abdulla, or Abdulla banks, are situated on the Arabian side of Fao, distant about 15 miles, in an old estuary of the Shat-al-Arab; they are a group of rocks with much mud and sand silted up in between them, and round them is a huge mud flat at low water ; on the Khor the Crab Plovers nest in colonies, excavating burrows two to four feet long into the sand, at the end of which *one or two* eggs are deposited. The breeding season is well known to the Arabs who do quite a trade both in birds and eggs in the country around. The birds are taken from the burrows, put into baskets and taken to Basra for sale ; Armstrong who tried eight of them in a pie found they were very good eating ; they had been taken from nest burrows and all were females.

This account agrees very well with that of Huskisson and Nash who visited breeding colonies on islands near Bushire (*Hume's Nests and Eggs* 4. p. 328) except that they invariably found a single egg in each burrow and I think we may take it that this is the correct number.

This aberant species lays a pure white egg, utterly unlike a wader's egg, and is very large for the size of the bird.

Comparatively little is known about the nesting economy of this bird and should any ornithologist be able to visit the Khor in the nesting season and make observations there he would be well repaid for the discomfort of the heat. Eggs may be looked for early in May and both eggs and young early in June. Spirit specimens of both chicks and adults are great *desiderata* for working out the relationship of this anomalous bird.

289. Turnstone. Arenaria interpres.

Arenaria interpres (L). (Syst. Nat. 1758, p. 148—Sweden:)

Probably not uncommon at Fao as a winter visitor. Finch obtained one on February 17th and Cumming shot one there on June 18th so that probably some non-breeding birds spend the summer there.

(To be continued.)

Edward P. 1922.

H. R. H. The Prince of Wales, Patron and Life Member of the Bombay Natural History Society

H. R. H. THE PRINCE OF WALES' SHOOTS IN INDIA IN 1921 AND 1922.—Part I.

By

BERNARD C. ELLISON, C.M.Z.S.—(*Naturalist to the Shoots.*)

(*With 9 plates and a map.*)

Nepal.

To the average Englishman in India, but little is known of Nepal or its people. Brian Hodgson, to whom we are indebted for most of what we know of the Natural History of the country, gives an account of the physical characters of Nepal dividing it into 3 distinct regions according to the elevation of the several districts. The lower region consists of the Terai, or Marshes; the Bhawar or forest and the lower hills, with a climate approximating that of the plains of Hindustan, with a certain increase of heat and a great excess of moisture. Next comes the Central region composed of a "clusterous succession of mountains" varying in elevation from 3,000—13,000 feet, with a temperature of 10° to 20° lower than the plains; and, lastly, the juxta-Himalayan region consisting entirely of high mountains whose summits are buried in snow for the most part of the year and whose climate has nothing tropical about it except perhaps the succession of seasons. Before describing the arrival of H. R. H. and staff in Nepal on the 14th December and the sport subsequently enjoyed by the party, it is necessary to explain shortly the arrangements made by H. H. the Maharaja of Nepal to take the utmost advantage of the extraordinary sporting resources of his country. General Kaiser Shumsher Jung Bahadur, President of the Nepalese Committee relating to the Prince's visit and also officer-in-charge of the arrangements of the shoot, in a letter, says :—

"It was only in July (1921) that definite news of the Prince's visit to India being available, the question of H. R. H. having a shoot in Nepal was raised. The Prime Minister of Nepal had pressed the Government of India to arrange the dates of the Royal Shoot to fall in January, or better still in February, so that a better bag of big game might be anticipated, but in view of the extended tour in India and the Far East, the 14th and 21st December were given as the only possible dates. The Prince's stay in Nepal was, therefore, shorter than those of his father and grandfather.

In 1910 previous notice of more than a year had been received enabling the men to work for two seasons, *i. e.*, on either side of the rainy season to erect 2 shooting boxes and camps in the interior of Chitone for the use of H. I. M. the King-Emperor in 1911. The short notice on the present occasion compelled the Prime Minister to abandon the idea of a shoot in Chitone and consequently Pathenghetta off Bairagnia was suggested, but considering the poorness of game that side, a camp at Thon, the gate of Chitone, was finally decided upon."

The venue for the Royal Shoot was the Terai which may be classed amongst the richest and most strictly preserved game tracts in the world. The shooting camp prepared for the Prince was about 2 miles from Bikna Thori Station on the Nepal Border. It was not the same camp which was used on the occasion when H. M. King George visited Nepal. His Majesty's camp was about thirty miles away from the frontier, at a place called Kasra, where a permanent pavilion was built for the use of His Majesty. The present camp had no wooden pavilion, but nevertheless it presented a most delightful spectacle being a mass of creamy white tents shaded by giant forest trees, flanked by and overlooking the river: beyond the river lay a great tract of forest land, and still further in the distance the snow capped peaks of the Himalayas. On all the other sides jungle of the thickest kind and then the Indian frontier.

There were really three different camps. The Royal Camp was on a plateau by itself directly overlooking the river bed. Descending from this one came to the Press Camp, which, though on a lower elevation, still commanded the same view. Opposite this was the servant's camp which housed the huge following which generally accompanys a gathering of this description. About ¼ of a mile away through the forest lay H. H. the Maharaja's camp. The locality covered by the camp before the middle of November had been rank jungle—the haunt of wild animals, which had left their tracks even after the grounds had been tramped.

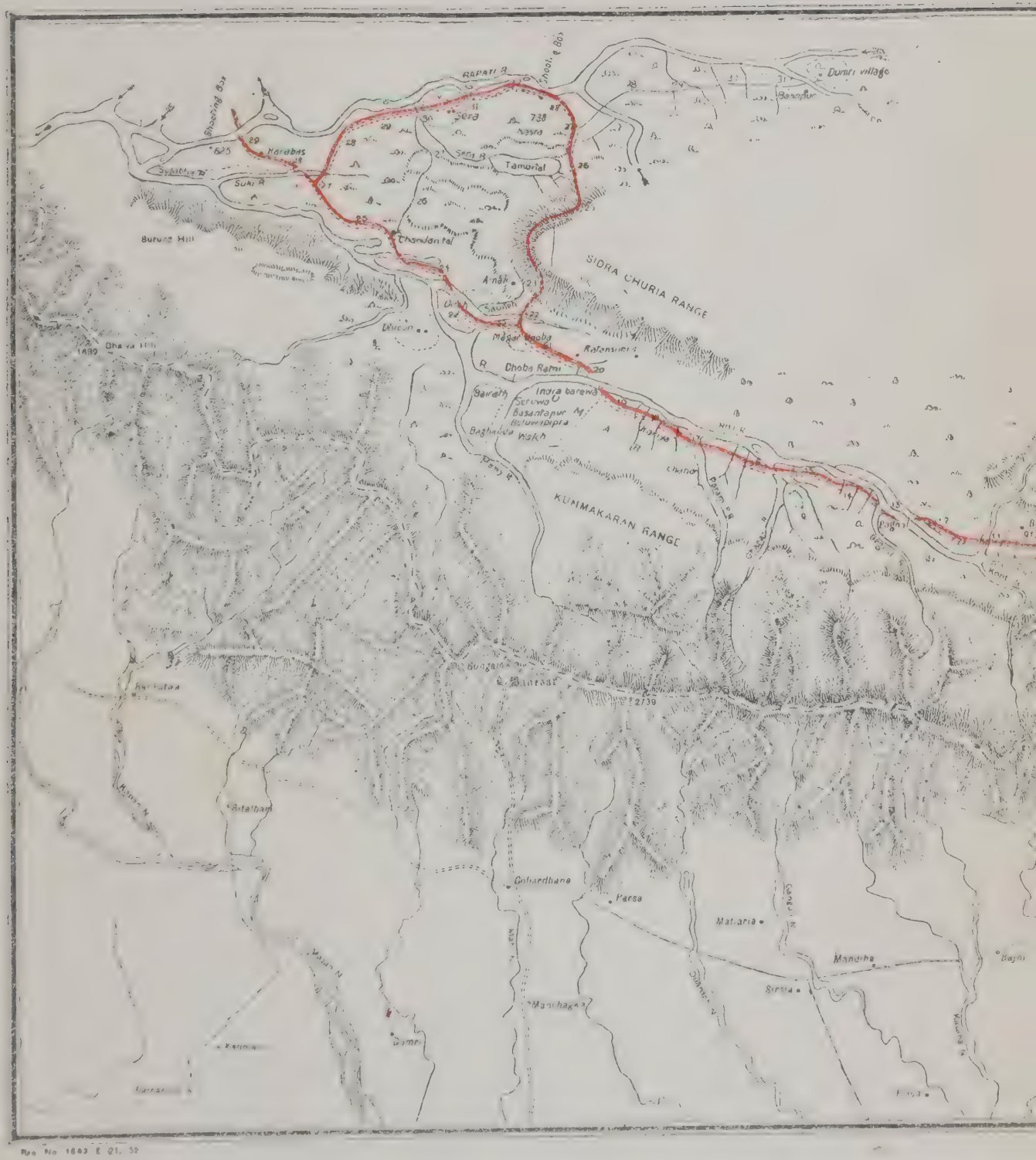
Both camps, that is to say H. R. H.'s and that of the Maharaja of Nepal were surrounded completely by pallisades and guarded by Nepalese troops. Great fires were lit at night to keep away a possible marauding elephant or wandering rhino or tiger. Such unwelcome visitors were always a possibility in a spot where wild animals abounded. A further provision against incidents of this description was a machan, termed very aptly a "Funk Machan," designed as a haven of refuge in the event of a stampede of elephants or the visit of a wandering rogue. The greatest attention to detail was displayed in the lay out of the camp and every provision was made for the comfort and convenience of the guests. The roomy tents which were beautifully furnished and fronted by garden terraces flanked an open lawn scattered with chairs and tables where people might sit in the evenings. Here also a huge bonfire flared all night and a giant yule log blazed—quite the biggest I have ever seen. The whole camp, both inside and outside, was lit with electricity from the great arc lamps which hung picturesquely from the trees, under which all the trophies shot during the day's sport used to be shown before being handed over to the ministrations of my men in the skinning camp, down to the little reading lamp by one's bedside which one could switch off before turning in.

The Royal suite of apartments were simple, yet all that could be desired, and ornamented, as befitted the occasion, with emblems and trophies of the chase. The floor of the mess tent was carpeted with Leopard skins pieced together as a great mat; the effect, as can be gathered, was extremely rich and striking. The very appointments of H. R. H.'s writing table were all mementos of sport in Nepal being made up from Rhino hoofs, horns and hide, and even the waste paper-basket was made from the lower joint of a rhino's leg. One cannot but refer to the beautiful albums on the tables of the mess tent, whose pages held the photographic record of many a famous shoot in the Nepal Terai.

The Camp had a well appointed Post and Telegraph office attached to it.

On the eve of the Prince's arrival it was inspected by H. H. the Maharaja of Nepal who, though in indifferent health, insisted on previously visiting the camp with Col. O'Connor, the British Envoy, to see that everything was as it should be for the reception of the Royal Guest. Of an urbane and generous disposition H. H. the Maharaja impressed one immediately by his character brimming over with good nature and kindliness. I was also introduced to the Maharaja's sons, all of them Generals. It is the custom in Nepal, I believe, to have all Royalty created Generals practically simultaneously with their birth. I was much impressed with the youngest boy who, though only eight years of age, had a few days previously single handed accounted for his first tiger.

Very efficient arrangements were made by the Nepal authorities for the disposal of the game after each shoot, and Lieut. Hem Bahadur Rajbhandair, the Nepalese officer attached to the writer, was most helpful. The skinning camp was situated about a mile from the main camp. This was a mistake in my opinion although the reasons for it were very good and sound. The people who placed it there, considered that for sanitary reasons it was advisable to have all the skinning done as far away as possible. On all the other shoots I asked to have the skinning camp within a quarter-of-a-mile of my own tent, and accommodation for my own men provided on the spot. This worked



The road from the Royal Shooting Camp at Dikna Thori is marked in red. At different p
place. On the extreme left of the map is Kaira where His Majesty King George V stayed,

better, I found, as, after the animals came to the camp and had been viewed by H. R. H. and the people who shot them, they were immediately and without delay sent to the skinning camp and on arrival at once dealt with by our department. In shooting on a large scale celerity in skinning is a great point, particularly in the present instance where I had only two men* with me who could be trusted to attend to the more intricate points of skinning, such as the head and limbs. We obviated difficulties as regards nauseous smell, etc., which otherwise would have made the skinning camp in Nepal a perfect Golgotha by a plentiful scattering of lime and disinfectants. However in spite of this at times, when we had five or six disarticulated rhino together with numerous tigers and an odd bear in different stages of skinning, the stench was almost unbearable.

Before describing the shooting I cannot but comment on the elaborate and extremely efficient methods adopted for giving prompt and exact "khubber" about kills and the movements of game. This was accomplished by a precise system of signalling, on a scale which I think has never been attempted before on a shoot of this description. The whole arrangement was under the direction of Lieut. Leonard, R.E., who had arrived in Nepal some weeks previously to put up a system of telephonic communication between the Royal Camp and certain suitable spots, within the forest for a radius of 30 miles. Lieut. Leonard was assisted by a party of English Sappers who during the period during which they were engaged in putting up the necessary wires and installation spent a very thrilling fortnight alone in the jungles. Considering that these jungles in normal times abound with dangerous game of all description, and that particularly at this period when in preparation for the Royal Shoot there had been a close season for some time, it can be readily understood that Lieut. Leonard and his party had some exciting experiences to recount of the time spent in the Nepal jungles. One of the receiving field stations was fixed to the trunk of a tree near by my tent and every morning on my visit to the skinning camp I would ring up for news and would be promptly informed as to the whereabouts of the last "Kill" or the location of a tiger 10 or 15 miles away. No rhino was untracked or tiger left to itself. The rhino no sooner began to doze off as the sun grew warm, as is his wont, than the tracker climbing up a neighbouring tree made signs to his mate on the ground who ran off to flash the news by the nearest telephone station.

I give the following extract from my diary of the first day's shoot :—

December 14th.—At Biknathori to-day the camp is aglow with excitement from early morning. I was awakened by the trumpeting of elephants and the shouts of an army of Nepalese attendants. I watched the little Gurkhas passing to and fro near my tent. What a noise these stout little fellows with the Kukris make ! Talk is of nothing else but the arrival of the Prince and the prospects of the shooting. A very large tiger had been seen and it was hoped that it would fall to the Prince's rifle. Shortly after 9 a.m. a fanfare of bugles announce the arrival of the Prince. The Nepalese Guard present arms and the Royal Car sweeps into the camp followed by the cars of his suite. The Prince steps out, looking remarkably well and boyish in light khaki Jodhpur breeches, shooting coat, and Sambhar leather shoes. A few minutes were spent in introductions. Then off we all go in the cars to the shooting beat. This is quite near the camp, at a place called Sarasvati Khola. We get out of the cars and mount the pad elephants which take us to the line of elephants, with howdahs, in position by the river bed. His Royal Highness mounts into his howdah which, by the

* I brought with me from the Natural History Society two skinners—N. A. Baptista, a Goanese skinner of considerable experience who for many years had been in the employ of the Society, and my servant Rawjee Kaneira, a Hindu, who had a knowledge of skinning. Under my supervision they did all the skinning in the principal shoots in India and Nepal and worked exceedingly well.

way, is the same as was used by his father when he last shot in Nepal. The rest of the party are the Earl of Cromer, Admiral Sir Lionel Halsey, Col. Worgan, Lord Louis Mountbatten, Capt. the Hon'ble Piers Legh and the Hon'ble Bruce Ogilvy and myself. Every-body is expectant though nothing happens for sometime. On the other side of the huge river bed, now reduced to a narrow stream, stretches the jungle for mile on mile. It is very hot, the elephants are impatient and every now and then one of them gives utterance to restless trumpeting. Suddenly there is a movement on the left hand side of the line and General Kaiser, the Master of Ceremonies, who had organised all the Shikar arrangements in connection with the shoots, rides in on a fast trotting pad elephant with news of a tiger and off we start. The elephants move forward with their wierd lumbering gait. H. R. H. leads the procession : followed immediately by the party and then an army of pad elephants, and still more pad elephants to be used in case of accidents. Ponderously the line proceeds through the dense jungle, crossing many a placid stream, and emerging at times from the cool shade of the giant trees into some glade where the sun beat hot and fierce, only to plunge again into the cool depths of the evergreen jungle. One is instinctively impressed with the calm and twilit grandeur of these gigantic forests. Within their depths all is stillness and no movement is discernible. There is nothing to break the monotonous tread of the elephants save an occasional burst of drumming from cicadas whose shrill music subsides as quickly as it rises. Suddenly there is a stir in the line. All the elephants begin to close up, shoulder to shoulder, and the great beasts stand to form the ring. All is expectancy : there is an outburst of shouting from the beaters : out rushes a deer and escapes terrified into the jungle shortly followed by another and another. Then the real thing happens and there is a cry ' Bagh, Bagh ' from the beaters. The tiger at last ! A glimpse of a yellowish form is seen in the long grass for the space of a few seconds and is at once lost to view. Once again it is seen behind a tree trunk. Closer advance the beaters, the tiger charges out, but he is a wary beast and seems to know intuitively where the guns are posted and gives them a wide berth. Again and again he is driven out only to seek cover in the long grass away from the guns. A Shikari climbs a tree and pelts him with stones. The manœuvre succeeds, and once again we get a half length view of ' stripes ' as he makes a spring at his tormentor in the tree top. The ring closes in upon him, but with a roar he dives into the long grass ; another roar and he shows himself quite near the Royal howdah. A moment's suspense and H. R. H. fires and a second afterwards two more shots ring out. The Prince has hit. The tiger though mortally wounded has plenty of go in him and charges to the opposite side and is buried once more in the heavy cover. The ring closes in : a shot rings out : and the tiger rolls over dead. I descend from my howdah and measure him. It was a striking scene this great circle of sportsmen, beaters, mahouts and elephants, waiting in silence while the measuring was done. The tiger taped 9 feet but he was a royal beast and looked splendid when I saw him later stretched out for the Prince's inspection near the great log fire in the Royal Camp. In the evening we had news of three more tigers having been shot by another party who had gone farther afield. There appears to have been much excitement, and no little risk, experienced on the occasion, as several of the party were filled more with zeal than with experience of tiger shooting, guns were pointed in all directions and the poor tigers eventually succumbed to a perfect fusilade of bullets. One of the members of the party contributes the following description of the exciting episode :

" The tigress came out straight towards my elephant, but turned very quickly to its own right, and I fired just as it turned back into the jungle. I hit it on the near quarter, and broke its hind leg with the first barrel. The second barrel I fired as it was disappearing in the jungle and from what we

H. R. H. the Prince of Wales mounting into his Howdah on the first day's shoot in Nepal.

On the trail after Rhino.

Elephants crossing a stream.

found afterwards apparently hit it on the tip of the tail! There was a great difficulty in stirring the tigress out again from the jungle, so we went in on our elephants when she suddenly came out and charged the elephant P. was on, which turned round so quickly that P. sat down on his topi and squashed it flat. The tigress was finished off, I think, by H. but I am not quite certain."

After dinner I went down to the skinning camp to see what had been done as regards the disposal of the trophies. It was an eërie experience tramping through the heavy jungle after nightfall. Of course in the present instance, with so many people about, there was not much danger though everywhere one saw the pug marks of tiger, and the tracks of elephants. Thanks to the efforts of my men the work of skinning the various trophies had been satisfactorily concluded and so with an easy conscience I went to bed.

December 15th.—To-day was fixed for the first rhino shoot. We did not get off till 10 a.m. as there were several delays. Even after a start had been made there was a stoppage caused through a huge lorry breaking down on the very steep hill leading up to the entrance of the camp. None of the cars could get past the obstacle and there was nothing for it but to get out and push, and H. R. H. was the foremost of all in helping. At last we were all speeding along bumping over the forest road that had been specially constructed for the purpose of the shoots. The first part of the journey was through a dense piece of jungle. One realised how difficult a task a hunter would have in bringing his quarry to bag in a forest of this description. This is one of the main reasons why the 'ringing' method of hunting tigers is practised in Nepal. The dense jungle found in the foot hills of the Terai must be seen to be appreciated. Massive elephant grass up to 20 feet in height, and so thick as to almost obscure the elephant from the view of the Howdah occupants in his passage through it. Often it is not possible even to see the next elephant though it is only a few yards away. Our destination this morning is Thoba, a run of 20 miles by motor. The road led for the most part of the way through the cool depths of the forest till the vicinity of Thoba was reached. Here the country was open with fields of yellow mustard on either hand. The *machans* erected in their midst told of the eternal warfare waged by the ryot against the jungle denizens. At the 22nd milestone we leave the cars to mount the pad elephants. Besides H. R. H. the party includes Lord Cromer, Admiral Halsey, Col. Worgan, Capt. Ogilvy, Lord Louis Mountbatten and myself. H. R. H. looked rather tired, as even after yesterday's long journey and long shoot, he had been playing polo at 6 a.m. Before arriving at the spot where the ring was formed it transpired that the tiger had broken back. Shortly afterwards the elephant in which the Prince was riding got bogged in crossing a stream and H. R. H. transferred to an ordinary pad elephant. The sight of a line of elephants crossing a stream is always impressive. I call to mind as I write, the stately array of elephants crossing the Thute river at sunset, the great grey beasts plunging through the swirling water, the red light of the setting sun, and the dark forest background, all combined to make an impressive and unforgetable picture.

One quickly gets accustomed to elephants as a means of transport. A pad elephant is generally the most comfortable and certainly the best as far as celerity goes, though possibly not the safest, as in the case of a charging tiger the man on the pad takes his chance of being mauled. All honour to the plucky mahouts who guide these great beasts sticking gamely to their posts often in moments of extreme danger. Many have paid with their lives for their coolness and daring. In fact one of the brave fellows was killed on a pad elephant a few days after the Prince's departure. The occupant of a howdah is practically safe from the onslaught of a charging tiger, but there is one risk which is always present in shooting from an elephant in heavy forest and that is the possibility of the

elephant taking fright, and bolting when mahout, howdah and occupants stand a very good chance of being swept away in the headlong rush of the beast through the jungle. To return to what happened. The party arrived at the spot where the shooting was to take place at 1 p.m. and an adjournment for lunch was agreed to with general acclaim. Several rhinos had been seen in the swamp in close proximity and the chances of a good afternoon's sport seemed assured. After lunch we mounted our elephants and it was not long before a rhino was discerned in the thick grass cover. H. R. H., whose position was rather disadvantageous, since he could scarcely see the animal from where he was, fired. Lord Louis Mountbatten fired immediately afterwards and the rhino made off. A prolonged search was made for the beast. The blood-spattered leaves and grass showed clearly that the bullet had found its mark, but it was not till many days later that the beast was picked up dead. It was then too decomposed for preservation, but the skull and horn were recovered. It proved to be the best of all the rhino heads obtained in Nepal during the present shoot. A second rhino wounded on this day by Capt. Dudley North was picked up later under similar circumstances. As we blundered through the dense forest in search of the wounded rhino one could not help thinking of what would have been the effect on our ranks, if a rhino took it into his head to charge, bunched up as we were at the moment. The consequences would have been rather disconcerting as the resultant stampede would not exactly have been a pleasant experience.

Just before the search was abandoned a tiger was seen, a ring was immediately formed and the animal was soon accounted for. H. R. H. fired at the beast but missed. The tiger took cover, but immediately reappeared giving Sir Godfrey Thomas a broadside shot at close range.

Shortly afterwards H. R. H. returned to camp, but certain enthusiasts remained till dark without any results beyond a rather exciting five minutes with a pig. In the fading light an animal was discovered moving in the bushes. Everybody thought it was a panther or a tiger, a ring was formed. Whatever it was, it took a great deal of dislodging, but at last with a protesting squeal out rushed a much harassed and disgruntled porker who promptly dodged through the lines of elephants and vanished into the jungle.

Friday, December 16th.—There were several different parties on this shoot. H. R. H., Col. Worgan, Capt. the Hon'ble Piers Legh, Commander Newport and Lord Louis Mountbatten motored to the 13th milestone to a place called Bagliae. A ring had been formed about a half a mile from the road and after the party arrived H. R. H. himself posted the guns placing them at intervals of about 50 yards. Shortly after the beat commenced, a tiger broke in front of the Prince's howdah. H. R. H. fired and was immediately followed by a right and left from Capt. the Hon'ble Piers Legh. The next 20 minutes were spent in an effort to dislodge the beast from some heavy cover. Very suddenly "Stripes" put in a second appearance, but a shot in the leg from Mountbatten sent him limping back into cover. The ring now closed in upon him and the tiger making his last bid for liberty sprung gamely at Lord Louis' mount and was dropped with a shot through the head. A subsequent examination showed that only the last two shots had taken effect and the trophy accordingly went to Lord Louis Mountbatten. H. R. H. returned to camp after lunch while the remainder of the party went off on a fruitless quest after tiger.

A second party consisting of the Earl of Cromer, Capt. Dudley North and two others spent the morning after rhino at Kasra. One was secured which fell to Capt. Dudley North's rifle. The party went into some very thick jungle bordering a lake where the shikaris had previously located a few rhino. The rhinos were heard moving about as the elephants approached

H. R. H. WAITING FOR THE TIGER TO BREAK COVER.

THE LINE OF ELEPHANTS MERGING FROM THE JUNGLE

THE ROYAL ELEPHANT IN A TYPICAL RHINO SWAMP

H. R. H. TAKES A SHOT.

and presently one of them was seen by a young member of the Maharaja's family, in the howdah with Capt. Dudley North, who urged him to fire. Capt. Dudley North had previously won the toss for the first shot and the occupant of the adjoining howdah who had also seen the animal excitedly pointed him out: Capt. Dudley North writing to me said:

"I could see nothing and told my friend so, he however still urged me to shoot. I could not see anything so I aimed at what I presumed was the object he intended and fired. Absolutely nothing happened and the conglomeration of the tree stump and grass which might have been or looked like a rhino remained exactly where it was. Even the real rhinos in our vicinity did not stir. We continued groping about in the big grass and shortly afterwards two rhinos dashed out of the pool away from us and in an impossible position for a decent shot. We tracked them for some distance, and were in a small clearing on the edge of some very high grass when we observed a great commotion going on near by. The top of the high grass was violently agitated as though some great beast was pushing through and there was no doubt that a rhino was coming our way and shortly afterwards he did, with a rush, charging straight at my elephant. The high grass parted and directly I saw the horn on the top of his nose, through the dense cover, I fired. Lord Cromer, on my left, fired two barrels in quick succession and my elephant wheeled round immediately I fired, and was for getting out it, so I did not have much time to see exactly what happened. The impression was that the rhino stumbled and almost fell but recovered and made off through the grass. Lord Cromer was of the same opinion and thought both our shots had taken effect. In the confusion of elephants trying to bolt no one had time to shoot at another rhino which came out on our right but went back into cover very quickly. There were blood traces which we tracked for some time but eventually lost. This rhino was picked up dead some days after the Royal party left Nepal."

After the above incident the party formed into line moving slowly through the jungle. Shortly afterwards a rhino was seen and very fortunately bagged by Capt. Dudley North. The beast was hit through the spine half way down its neck and dropped in his tracks needing only another shot to give it its quietus. Capt. Dudley North was using a double-barrelled ·470 Gibbs Rifle with a solid bullet.

Admiral Halsey with a party consisting of Sir Godfrey Thomas, the Hon'ble Bruce Ogilvy and Col. Harvey secured a tiger late in the afternoon of the same day. The morning had been blank and after lunch a second attempt was made. A very long trek through dense jungle where everyone got more or less lost, brought no result. So a man was sent ahead to reconnoitre; it seemed that all arrangements had failed, and a return to camp was decided on at 4 p.m., a few minutes after however 'Khubber' was brought that a tiger had been ringed quite close by. Soon all the guns were in position and a few minutes later Admiral Halsey bagged his tiger with a shot through the neck.

Saturday, December 17th.—H. R. H. spent the morning after small game and with his party accounted for some 25 head. The Admiral, Col. Harvey and Lord Louis Mountbatten motored to Kasra (30 miles) after rhino. They saw none and had a tiger beat which was also blank. The same morning Capt. Poynder and Capt. Dudley North both had a shot at a rhino which fell to the former's rifle. She was a gravid female. When it was being skinned a calf was found *in utero*. The animal gave no trouble and did not charge, but as Capt. Dudley North afterwards said "she took a terrible lot of killing."

The rhino shoots in Nepal showed very clearly the extreme difficulty of bringing these animals to bag without a vital shot. In the dense swamps of the Terai a wounded rhino is practically impossible to track and recover. In the present instance the rhino was spotted in a strip of grass jungle

flanked on three sides by forest and on the fourth by a watercourse. 'Stops' were posted in trees on two sides and Capt. Poynder and Capt. Dudley North walked their elephants through the thick grass to a point from which the animal could be seen. The rhino moved off on their approach, but was turned back by the tumult raised by the stops and blundered back to within 10 yards of the guns. It was extremely difficult to see in the heavy cover but both Capt. North and Capt. Poynder fired, putting 4 high velocity ·470 bullets into it. The rhino lurched forward but got away and was again turned by the stops, some 200 or 300 yards off when the brute was finally dropped with a shot through the neck from Poynder's rifle. All five shots had taken effect. Four of them in the region of the shoulder. The shot in the neck had finished it. But for this, and the 'stops' posted in the trees, the animal would have got away in all probability to perish miserably in the trackless swamps. A shot in the vertebrae in the forepart of the neck will drop a rhino in his tracks. This and the brain shot would seem to be the most effective. Mr. Percival Landon shot his large bull rhino at a 100 yards with a single bullet from a ·350 rifle, placed three or four inches in front of the root of the ear.

Another party consisting of Col. Worgan, Mr. Petrie, Sir Godfrey Thomas, Commander Newport and Capt. the Hon'ble Piers Legh left camp on elephants late in the morning. They went down to the river bed from Bikna Thori Station about 4 miles and changed from the pads into howdah elephants. The ring was formed and very soon a fine tigress gave Sir Godfrey Thomas a shot. "It was not a difficult one," wrote Sir Godfrey later, "and Rushbrooke Williams who was in my howdah is certain that I hit it. Personally I am not at all sure as my elephant had no guts and turned round and more or less bolted as soon as the tiger appeared. I was on the floor of the howdah and Rushbrooke Williams nearly fell out while the elephant began to make for the woods. Luckily the mahout stopped the brute and we got back near the line to see the tiger down with everyone shooting at it. It took an awful lot of lead to kill it stone dead. An uproar then began down the line and we discovered that there were two cubs outside the ring. The line closed in upon them as we had an idea of taking the beasts alive, but they were too big to catch without nets and a good deal of preparation, and too young to leave, as in all probability they would not have lived without their mother. Col. Worgan got one and Commander Newport the other. All the way home the jungle was beaten but nothing was seen."

A tiger measuring 9 ft. 2 inches was also shot by Capt. Bruce Ogilvy on this day.

Sunday, December 18th.—It being Sunday there was no shooting to-day, and this was rather a relief to my skinning department, which had been working at high pressure the last few days getting rid of the great mass of material that had been sent in. I was up all night with my men, as, with so much already having come in and with great disarticulated limbs of rhino arriving continually I had to work against time to prevent anything being spoilt. Day and night operations thus became the order. We had a generous supply of disinfectants which were scattered with a lavish hand, but even so it was an obscene business and not to be dwelt on more than is necessary. An entry I saw in the diary of a member of the staff succinctly describes the case. "I visited the skinning camp where Ellison is dealing with the stuff; there was an appalling stink there ! ! !" The skinning camp was guarded day and night by Gurkhas. Tigers' claws, whiskers and fat and kindred articles are of much value to the native who has uses for them not dreamt of in our philosophy and with such a profusion of riches lying about one had to guard against the intrusion of the "snapper-up-of-unconsidered-trifles." One such gentleman we caught red-handed and his subsequent fate at the hands of the Nepalese officials was a sufficient deterrent against attempts of this nature. Anent the tigers fat. To me came

diverse petitioners pleading for a modicum of the precious adipose, reputed as a panacea for many ills, but as Pharoah of old to his starving Egyptians, I commended them to Joseph, in this instance Baptista, my head skinner. To him in the course of his labours had fallen a bountiful harvest of the desirable unguent and to the waiting multitude he bestowed his favours, with, I am afraid, a somewhat niggardly hand.

Sunday afternoon was spent in the distribution of gifts and mementos from the Maharaja to his guests. Among these were a number of beautiful silver mounted kukris which were presented to various members of the party, a fitting memento of their days in Nepal. According to time honoured custom H. R. H. was the recipient of a number of live animals and birds. A list of the collection is printed at the end. Among the animals was the famous 'unicorn' sheep of Nepal. These are normally two horned. When quite young the horns are bound closely together so that they grow up in contact with one another giving them the desired "unicorn" effect. The birds included a very fine series of pheasants. Particularly striking were the gorgeous Monauls, the Tragopans with their crimson white-spotted breasts, and the little Blood Pheasants in green splashed over with blood-red markings. After being inspected by the Prince the collections were finally handed over to the writer and at the close of the shikar in Nepal were brought down to Bombay where the animals and birds were temporarily housed in the Victoria Gardens previous to their being shipped to the London Zoo, their final destination.

Monday, December 19th.—On this day His Royal Highness shot a rhino at Sarasoti Kola. Capt. Dudley North describing the shoot writes :

> "I went out with H. R. H. after Rhino. We went to where one was reported and soon sighted a Rhino lying down. H. R. H. had not seen one properly before so that at first he did not recognise it as they are so difficult to distinguish in heavy cover. However when the brute rose he saw it. The Rhino moved slowly towards us and I suggested his firing a raking shot into it, but H. R. H. very rightly preferred to wait for a more advantageous position. The Rhino turned to the right and the Prince fired. His first shot hit, though rather high, and the beast swung round and H. R. H. fired again hitting it this time on the neck. We followed the beast into very heavy cover, but the trees were so thick that it was impossible to get a clear shot, the elephants were just getting clear of the trees when the Rhino was dropped by one of the Nepalese officials* who had fired as he was under the impression the beast was going to charge. H. R. H. used my ·470 Gibbs Rifle which I lent him."

A separate party consisting of Sir Godfrey Thomas, Capt. the Hon'ble Bruce Ogilvy and Lord Louis Mountbatten spent a fruitless morning after Rhino at Kasra. The day was not without its excitement however, as in the course of operations Lord Louis Mountbatten's elephant suddenly went 'musth' while he was in the howdah. The party was going through what one of them described as "the longest and thickest grass I have ever had the misfortune to encounter" it was several feet above the head of a man standing up in a howdah. Without any appreciable warning Lord Louis' elephant attacked another animal on which a Nepalese Colonel was sitting and disappeared into the bush. Fortunately the mahout managed to stop him by slashing at his head with a kukri. Lord Louis was then rescued and transferred to another elephant. After that the party went through "still worse country"; the noise the elephants made crashing through the tangle of tree and grass was sufficient to scare any game within a radius of miles, so the shoot was abandoned and the party retired to the base and motored back, reaching camp long after dark.

Near Dhoba, one mile to the south of the 22nd milestone, the same morning Mr. Percival Landon, who was with another party, bagged a fine bull rhino with a single shot clean through the brain. I am indebted to Mr. Percival

* General Kaiser Shamsher Jung Bahadur.

Landon for the following graphic description of the day's sport. "The Rhino was shot after the first ring at which Lord Cromer secured a fine leopard as well as the largest tiger that had yet been shot; the party divided as the beaters had reported two finds three or four miles away—some animal, probably another tiger, cornered in a dense bit of jungle, and a rhino in an open plantation. Mr. M. A. Metcalfe, Capt. Poynder and Mr. Percival Landon went after the Rhino on elephants. By this time the sun was getting low. They made their way across more or less open country for about two miles and then entered the plantation. This was irregular in character. large woods of free growing young *sal* alternating with treeless stretches of coarse shoulder-high grass indicating swampy soil, the whole being surrounded by a ring of thick and sometimes impenetrable undergrowth. The light was fading, tending to become yellow, a fact which only enhanced the unusual beauty of the surroundings. The party moved forward in silence broken only by the steady crash of what light undergrowth there was under the *sal* trees, or the tear and the squish of the high marsh grass. Several times, where the mud was exceptionally deep, they came upon signs of recent wallowings, but of rhinoceros they saw nothing though they spent over an hour in carefully quartering the plantation in response to the noise and whistles of the beaters on foot. They were on the point of giving up and returning to the rest of the party when a soft but insistent whistle some distance to the right turned them back for a last chance. Mr. Landon was on the right hand elephant with a Nepalese officer and slightly in advance of Mr. Metcalfe and Capt. Poynder, when he suddenly came in sight of a huge rhino. He was standing sideways motionless among sal trees well lighted for a shot. He stood about 6 feet high, and as roughly paced out afterwards, was 9′ 10″ in length. In the low evening sun he looked as big as a locomotive. Mr. Landon fired twice, the first bullet hitting it nearly opposite the centre of the spine, though whether the bullet did much work through the plate at that angle one cannot say. It did not seem to have any effect. With the second shot he hit it clean through the brain and the rhino sunk down in his track, without a movement, stone dead. The distance was just 90 yards and everybody came up to find the beaters already closed in and celebrating the occasion, with the amazing rites that always accompany the killing of a Rhinoceros in Nepal. Everything that could hold blood was requisitioned and the thick blood flowing from the nostrils was collected with the utmost care. This was not a concession to the spirit of the monster, as in the rite of the dabbling of a tiger's whiskers in his own blood. A Rhinoceros's blood is apparently unrivalled as a viaticum for the dying, ensuring for the soul both a peaceful departure and a happy rebirth on the other side. There are indeed many superstitions about a dead rhinoceros, but it is worth noting that its power for ensuring peace for the departed soul is retained by the mere empty shell—it is hard to call it skin—of the beast for years after its own decease. The scene was a strange one and Capt. Poynder aptly re-called the prehistoric association of 'Tarzan of the Apes' as half a dozen elephants closed in from nowhere and ranged about the inconceivable scene of blood ritual which was carried a step further by the decapitation, amid fountains of blood, of the beast's head. There was no time for witnessing the 'gralloching' of the carcase, another messy and obscene ceremony of great importance. The head was measured from the top of the snout to the fold of the hide over the jaw bone and found to be a shade over 30½ inches straight. The horn was of no great height perhaps 8 inches but of massive construction. The colour was of an unusually light grey and the only mark on the head was that of the ·350 bullet three or four inches in front of the root of the ear."

In the afternoon news was brought to the Camp that a tiger had been ringed about six miles out; the following party therefore went out after him :—

H. R. H. The Prince of Wales, Col. O'Connor, Captain Dudley North, the Hon'ble Piers Legh, Captain Ogilvy and Captain Villiers.

H. R. H. TAKES A HAND WITH HIS KUKRI IN DECAPITATING A RHINO.

A FURTHER STAGE OF THE RITUAL.

The dismembered head of the Rhino is seen on the right of the pothograph. H. R. H. is an interested spectator at the ceremony.

PEGGING OUT A TIGER SKIN.

THE SKINNING CAMP AT THE CLOSE OF A DAY'S WORK.

In about three quarters of an hour the party reached the spot where the tiger was surrounded, the ring being a fairly large one and the jungle in the middle unusually thick. The tiger, or tigress as she turned out to be, gave very good sport and was finally bagged by Captain the Hon'ble Piers Legh, who dropped her with a very fine running shot clean through the heart.

Information was then brought that there was another tiger not far off, which there was a chance of ringing if people liked to hurry out, but as it was getting late and the chances were not very great of reaching the spot in time, His Royal Highness and Col. O'Connor returned to the camp. The remainder, however, went on, on the off chance and after they had plunged into inordinately heavy jungle for the space of a further half hour, came to the spot where the Shikari said the tiger should be, and started trying to ring him. Captain Villiers thus describes what happened :—

> "I suddenly saw a tigress cantering quite slowly diagonally across towards my elephant and after waiting till she was within easy range I fired and got her through the shoulder dropping her immediately, but not killing her outright since the shot just missed the heart ; I finally despatched her with a second shot. I was shooting with a ·22 bore double-barrelled rifle made by Messrs. Manton & Co., which, I may mention, is without any exception the nicest weapon I have ever handled ; it comes up to the shoulder just like a well fitting 12 bore and it was interesting to see how effectually this extremely small bore, but very high velocity weapon stopped the tigress. She proved to be a tigress measuring 8 ft. and was in excellent condition."

Judging from the trophies received at the skinning camp, this day, Monday, December 19th, provided the most successful sport.

In addition to the rhino bagged by H. R. H. and the one shot by Mr. Landon a third rhino was accounted for by Commander Newport. The Earl of Cromer shot a fine tiger, the largest obtained in Nepal, during the Prince's shikar taping 9′ 10″, and a leopard. All this meant a considerable amount of work for my men, but it is to be recorded that they carried it through with the utmost zeal and fervour.

December 20th.—H. R. H. did not go out in the morning but remained in camp till after lunch when he rode out with Sir Godfrey Thomas and a few others into British Territory where he shot small game.

Lord Louis Mountbatten and Col. Worgan motored to the 22nd milestone at Dhoba where a rhino was shot by the latter. They then joined up with Col. Harvey, Col. O'Kinealy and Capt. the Hon'ble Piers Legh and went to a tiger ring which proved to be blank. Later a ring was made for panther and provided an exciting evening. On the elephants beating the ring a bear was found who caused a great deal of amusement charging round the ring and giving every one a chance of a shot. The shooting appears to have been "promiscuous," but it is to be recorded that the bear eventually succumbed. After the firing subsided the presence of the panther became a matter of doubt as he had not put in an appearance during the tremendous bombardment of Bruin, but on the ring closing up they flushed him, and he charged straight through the elephants and broke the ring. He was hit by Sir Geoffrey de Montmorency but was not deterred in his charge and went straight through. The ring reformed rather raggedly, and the panther again broke through springing on an elephant's trunk. He was dislodged but it was too dark to continue that evening and was shot the next day and proved to be a fine animal taping 7′ 6″.

Lord Cromer and the Hon'ble Bruce Ogilvy each accounted for a rhino in the course of the day and Capt. Poynder bagged a bear just outside the Royal Camp.

December 21st.—This was the last day of the Nepal shoot. H. R. H. rode out after lunch with Col. O'Connor, the British Envoy, Sir Godfrey Thomas and others.

In the course of the evening, near the village of Persanni, in British Territory, the Prince encountered a Hamadryad or King Cobra which he luckily killed. The party were walking up jungle fowl at the time. H.R. H. first shot at the snake as it was moving away and apparently hit it, for the brute turned and appeared to be about to attack him when he killed it with his second barrel. The snake was brought into camp with the rest of the day's bag. It was first assumed that it was an ordinary Rat Snake or Dhaman when examined in the fading light. Subsequently when the skin was examined at the Society's Museum in Bombay the identity of the reptile was revealed. The Prince's King Cobra taped 10′ 3″. The Hamadryad, the largest known poisonous snake in the world, grows to about 15′ in length. The record specimen now in the Society's Museum measures 15′ 5″. Much has been written about the ferocity of the King Cobra, and its propensity for making an unprovoked attack. When cornered a King Cobra may show fight, or a female will very probably attack should her nest or eggs be endangered, but experience has shown that these serpents under ordinary circumstances usually seek safety in flight.

On the 21st morning a party consisting of Lord Louis Mountbatten, Sir Godfrey Thomas, Admiral Halsey, Col. Worgan, Commander Newport, Col. Harvey and Mr. A. Metcalfe went down to Dhoba near the 20th milestone where a tiger had been ringed. The following is an extract from Sir Godfrey Thomas's Diary :—

"The ring was in very thick jungle and we spent sometime in getting the elephants to trample down a patch in front of each gun. Nothing happened for sometime till we got a fright when a big pig suddenly dashed out. Shortly afterwards we heard a tiger woofing in the middle but he could not be seen. Suddenly he appeared in the same place as the pig, and was just coming out when Mr. Metcalfe got him with a very good shot in the head. He could not see where he fell but he subsequently proved to be stone dead. Metcalfe was all for getting down to have a look at him but as they shouted out that there was another tiger in the ring we quickly resumed our places. Sure enough a tigress came dashing out again by an extraordinary coincidence right in front of us. Metcalfe missed with his first shot whereupon the beast charged the elephants on our left. There was a regular mix up, elephants trumpeting, squealing and going in every direction. I did not dare fire but Metcalfe took what looked like a pretty dangerous second shot, apparently without result. By then all the elephants had cleared off and seeing a gap the tigress went straight through. I turned round in my howdah and got a broadside shot just as she was disappearing. and thought I hit but couldn't be absolutely certain. However they swung the elephant round and made a big ring round the place she was going to. They beat about in the middle for sometime without anything happening. I thought she had probably slipped right through, as had she been wounded, they would have known it properly. However they suddenly discovered her quite dead having burrowed right under some grass so as to be practically invisible. Metcalfe and I were lucky in getting both beasts from the same elephant. My shot had gone right through about 6″ behind the shoulder."

All the shooting was finished by 6 p.m. and the evening was spent in saying good-bye. H. H. The Maharaja and his sons went down to Bikna Thori station to see the Royal Party off and the Royal Train steamed out of Bikna Thori station at 6-30 p.m.

Thus ended H. R. H. the Prince of Wales' shoot in the Nepal Terai which certainly for the colossal scale on which it was carried out is to be ranked among the greatest in the annals of big game shooting in this country.

NOTES ON NEPAL SHOOTING.

Rhinoceros (*R. unicornis*).

Throughout the shoots I never had the opportunity of measuring any of the animals in the flesh* as they were generally shot far away from camp, and were disarticulated on the spot and sent into the skinning camp in sections, this being the easiest method of transporting these big beasts. I am indebted to General Kaiser Shumsher Jung for the following note on the Rhinoceros in Nepal. General Kaiser gives the following measurement of a rhino which appeared to him as 'unusually' big :—

Height at shoulder	6′-4″
Length from nose to root of tail	10′-7″ (measured between pegs)
Tail	2′-1″
Neck	7′-6″
Girth behind shoulder	11′-1″
Maximum girth	12′-6″
Horn..	15½″

A female shot by Col. O'Connor during the 'Xmas camp, after the Prince had left Nepal, taped 5′-9″ in height at withers, greatest girth 12′. The longest rhino horn obtained in Nepal, was one of an animal shot by Lord Curzon, then Viceroy in 1901, at Morang. The horn measured 21½ inches with a circumference of 24¾ inches at the base. The record horn measures 24″ and was got by Mr. Briscoe in Assam.

Hodgson gives the following measurement of a new born rhino length 3′-4″ and height 2′. An animal 8 years old taped 9′-3″ in length and 4′-10″ in height, the maximum girth being 10′-5″. A fully developed calf in *utero* taken from an animal shot during the Prince's shikar in Nepal measured as follows :—

Length between pegs	4′-1″
Head and body	3′-4″
Girth	2′-9″
Weight	120 lbs.

Commenting on the habits of the animal General Kaiser writes, "Though it prefers swamps and high grass the great Indian Rhinoceros is also found in wooded jungles, up ravines and low hills ; along the numerous rivers it has its particular places for the evacuation of excreta. Along the runs to such places it walks backwards and falls an unsuspecting victim to poachers." The period of gestation is given by Hodgson as 17-18 months though General Kaiser says it is believed to be one year, and the cow produces one at birth. According to General Kaiser breeding takes place at all times of the year. Writers have commented on the longevity of the Rhinoceros, a hundred years being given as the age. General Kaiser is of opinion that as regards breeding and longevity the 'rhino' is 'first cousin to the elephant.'"

Rhinoceros are still very numerous in the Nepal Terai, especially so in Chitawan and along the Rapti river. In January 1907, 28 rhinos were bagged, 14 males and 14 females, yet the forests in Chitawan were in 1909 so full of them that no appreciable diminution in the stock had been made.

Many legends and beliefs are attached to the Rhinoceros in Nepal. Mr. Landon's eloquent account of the scene at the death of one of these animals during the shoot in Nepal is sufficiently illustrative of the esteem the animal is held in by the Nepalese in general. Commenting on the above General Kaiser writes :—

"The flesh and blood of the rhino is considered pure and highly acceptable to the *Manes*, to whom the high caste Hindus and most Gurkhas offer libation of its blood after entering its disembowelled body. On ordinary *Sradh* days

* With the exception of the Rhino calf in *utero*.

the libation of water and milk is poured from a cup carved from its horn. The urine is considered antiseptic: it is hung in a vessel at the principal door as a charm against ghosts, evil spirits and diseases." The above beliefs are in no-wise confined to Nepal as the Chinese, Burmese and Siamese preserve practically every part of the rhinoceros. The horn, hoof, blood, urine, hide and even the intestines being dried up and afterwards converted into various medicines.

As regards shooting rhino in Nepal the importance of a vital shot has been already commented upon. Selous in his 'Hunters Wanderings in Africa' in writing about rhino says :—"As with elephants it is very unsatisfactory work following up a wounded rhino as they do not go and lie down but walk on and on till their strength gives way. They die very quickly when shot through both lungs and the upper part of the heart, but if shot from the front, and the bullet only penetrates one lung, they will go on to all eternity though throwing blood out of their mouth and nostrils by the gallon. With a broken shoulder they will run first at a gallop and then at a halting trot for more than a mile, but if the hind leg is broken they do not appear to be able to budge a step."

Conditions in Nepal are entirely different from the country in which Selous shot; owing to the nature of the terrain the tracking of wounded rhino is practically impossible and many a mortally wounded beast has been lost in consequence.

A shot through the brain placed a few inches in front of the root of the ear would seem to be the most effective, or a shot through the forepart of the neck severing the cervical vertebrae. In the Society's journal Mr. G. C. Shortridge records shooting an Asiatic two-horned rhino with *a shot gun loaded with lethal* bullet dropping him at 7 paces with a lucky shot in the head which sma shed through the skull and lodged in the brain.

Writing of the Rhinoceros of Somali Land (*R. bicornis*) Captain P. Z. Cox (Society's Journal, Vol. XIII, p. 93 *et seq.*) describes his experiences and those of Donaldson-Smith, as to the effect of variously placed shots with heavy rifles, the conclusion arrived at being that the "knock out" blow is a broadside shot in the belly, the reason probably being that in this part of the Rhino's anatomy, there is such a number of nerves and blood vessels that a bullet planted therein causes him a violent shock to the system.

Another writer commenting on the above on page 538 of Vol. XIII takes exception to the belly shot, states he has no faith in head shots, and considers a shot behind the shoulder to be the most fatal.

Tiger (*F. tigris*).

The method of 'ringing' tiger with elephants is I think peculiar to Nepal and certain parts of Assam and is necessitated by the dense jungle, found in the foot hills or Terai. This must be seen to be appreciated. Dense elephant grass up to 20′ in height and so thick as to almost obscure the elephant from the view of the howdah occupant in its passage through it. The training of the actual elephants that beat the inside of the ring is astonishing. Time after time they beat through this dense jungle and in more than one instance have been mauled by the tiger. This also speaks volumes for the courage of the mahouts. The method of ringing was very interesting and exceedingly skilful. Two lines in a V advanced through the jungle where the 'kill' was known to have been dragged to, one line beating up towards the other. As soon as the tiger was flushed the open ends of the V closed in an incredibly short time, and in only two cases failed to enclose the game.*

The vitality of one tigress calls for comment; she and two cubs were ringed on, I think, the fourth day and was still alive and dangerous with 2 bullets through the head, one in the neck, one in the chest, two in the shoulders and one in the body.

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* For further notes on Tiger Ringing in Nepal, *vide* Field of April 22nd and May 6th, 1922.

H. R. H. THE PRINCE OF WALES WITH HIS RHINOCEROS.
H R. H. is seen wearing his Nepal Kukri.

A Young Great Indian Rhinoceros (*R. unicornis*).

One of a collection of animals and birds presented by H. H. the Maharaja of Nepal to H. R. H. the Prince of Wales. The animal was photographed at the Victoria Gardens, Bombay, where the collection was housed prior to its despatch to England.

Elephants (*E. maximus*).

The visitor to Nepal is struck with the numbers of elephants met with. The total roll-call of elephants used in connection with the Royal shoots was 423, which were divided into three sections according to the district, *viz.*, those assigned to Thore, those to Haraiya and those to Kasra. What the camel is to the desert the elephant is to Nepal—practically the only means of transport through its pathless jungles. In the wild state they are plentiful in the South of Nepal (the Terai). In some years they are more commonly found than in others. During the rains they visit the cultivated portion of the Terai doing a considerable amount of damage to crops, etc. For the greater part of the time they are buried in the dense jungle roaming in herds of 80 to 90 and, with the exception of an occasional 'rogue', doing a great deal of harm to life and property, these elephants unless molested seldom attack. Numbers are annually caught in Nepal and tamed, a young elephant being completely domesticated by the Nepalese in six months though an old elephant will often take a year to thoroughly tame. The pad elephant is perhaps more comfortable as a means of transport than the howdah-carrying beast. The danger of the animal bolting is a contingency which might at any time arise in hunting from an elephant in a heavy forest country, where an occurrence of this nature is fraught with extreme danger to the occupants of a howdah or indeed of a pad. A friend of mine related an exciting experience which befell him while shooting in the Terai. An infuriated rhino took it into his head to charge, and selecting the elephant on which he was seated made a terrific onrush. The elephant immediately turned and bolted for dear life, hotly pursued by the monster. My friend's mount was frantic with fear and went crashing through the jungle. In a moment half the howdah was swept off by the branch of a tree, the great beast not abating the pace one jot went on and on. My friend thought he would be killed and stood an excellent chance of ending his career. The rhino was close behind and would certainly have 'got home' had she not been turned from her purpose by her calf, who stopped abruptly and the mother seeing she was unaccompanied turned and gave up the chase. The elephant swerved to the left fortunately striking an open bit of country, but she did not give up her headlong flight, till she had put a good 2 miles between herself and the scene of the adventure.

Collection of Animals, Birds and Reptiles presented by H. H. The Maharaja of Nepal to H. R. H. The Prince of Wales on Sunday, December 18th, 1921, at the Shooting Camp, Biknathori.

Mammals and Invertebrates.

1 Baby Elephant (*E. maximus*).
1 Rhino Calf (*R. unicornis*).
2 Leopard Cats (*F. bengalensis*).
2 Himalayan Black Bears (*U. himalayanus*).
1 Black Leopard (*F. pardus*).
1 Clouded Leopard (*F. nebulosa*).
1 Tiger (*F. tigris*).
1 Tibetan Fox (*V. ferrilatus*).
1 Mountain Fox (*V. montanus*).
2 Sambhars (*C. unicolor*).
1 Tahr (*H. jemlaicus*).
3 Musk Deer (*M. moschiferus*).
1 One-horned Sheep (*Ovis* sp.).
1 Four-horned Sheep (,,).
1 One-horned Tibetan Shawl Goat (*Ovis* sp.).

Mammals and Invertebrates—contd.

2 Tibetan mastiffs (*C. domesticus*).
„ „ pups.
1 Monitor (*V. bengalensis*).
1 Python (*P. molurus*).

Birds.

4 Nepal Kalij (*G. leucomelanus*).
1 White Crested Kalij Pheasant (*G. albocristatus*).
4 Monal Pheasants (*L. refulgens*).
4 Cheer Pheasants (*C. wallichi*).
2 Koklass Pheasants (*P. macrolopha*).
4 Chukore Partridges (*C. chukor*).
Swamp Partridges (*F. gularis*).
2 Green Pigeons (*O. phayrei*).
10 Bronze-winged Doves (*C. indica*).
3 Great Indian Adjutants (*L. dubius*).
1 Hawk.
Pea-fowls (*P. cristatus*).

The animals were brought down from Nepal to Bombay under the charge of the writer of this article and Capt. Shanka Bahadur Shah, a cousin of the Maharaja, and some Nepalese assistants and though there was a certain amount of delay they stood the journey very well and arrived in Bombay on January 10th without any casualties.

BAGS* OF SOME OF THE SMALLER SHOOTS BETWEEN NOVEMBER 26TH, 1921, UP TO BUT NOT INCLUDING THE MYSORE SHOOT IN FEBRUARY 1922— TOGETHER WITH SOME FIELD NOTES.

SMALL GAME SHOOTING AT UDAIPUR.

26th November.

First Party. A party consisting of H. R. H. the Prince of Wales, Lord Louis Mountbatten, Col. Harvey, Capt. Dudley North, Commander Newport and Mr. D. Petrie went out to the Pichola Lake and shot 11 Snipe and one Chinkara in two and a half hours. They also shot at Fateh Sagar and got 1 Goose, 15 Snipe and one Chinkara. (The Chinkara were shot by Lord Louis Mountbatten and Capt. Dudley North.)

Second Party consisting of Sir G. de Montmorency, Col. Worgan, and Mr. A. Metcalfe shot at Jaisamand and got 15 Snipe.

A party consisting of Admiral Halsey, Sir G. de Montmorency, Sir Godfrey Thomas, Col. Worgan, Capt. Bruce Ogilvy and Mr. Holland, Agent to the Governor-General in Rajputana, went to Jaisamand. There were two beats for Sambhar and Leopard, but nothing was shot, though some Sambhar were seen.

IMPERIAL SAND GROUSE AND SMALL GAME SHOOTING AT BIKANER.

3rd December.

The whole party motored out from Bikaner to Kodamdesar to shoot demoiselle crane. H. R. H. and staff arrived at Kodamdesar at about 10 o'clock where they found a small artificial tank surrounded by huts with decoy cranes placed around. Having got into their huts, lookout men were

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* Most of the Bags were taken from the Royal Game Book now in the possession of the Hon'ble Bruce Ogilvy.

posted at various points who signalled when they saw flights of crane approaching. They were generally flying too high to start with, so people were told to let them fly round two or three times and let them get lower before shooting at them. In the morning at Kodamdesar the bag was 26 crane and 4 duck.

In the afternoon the party shot duck in Gujner Lake. They got 299 ducks.

Total bag of the day 303 ducks and 26 cranes.

5th December.

H. R. H.'s staff at Gujner shot 5 Duck, 1,061 Imperial Sand Grouse and 324 Common Sand Grouse.

Admiral Halsey shot at Gujner 1 Black Buck and 1 Chinkara.

6th December.

H. R. H. and staff at Gujner shot 2 Duck, 885 Imperial Sand Grouse and 29 Common Sand Grouse.

H. R. H. shot 2 Black Buck and 1 Chinkara.

Lord Louis Mountbatten shot 4 Chinkara.

BLACK BUCK AND DUCK SHOOTING IN BHARATPUR.

7th December.

Lord Louis Mountbatten.	1 Black Buck.*

8th December.

H. R. H and Party.	1 Black Buck. 2,200 Duck. †

In the duck shoot the birds remained more or less low for the first 20 minutes. Some of the butts were nearly 2 miles' walk from the edge of the lake. Consequently although people walked as fast as they could, the bugle for the commencement sounded 10 minutes before they could get to the butts. After this gun cases had to be opened so that some of the best part of the shooting was missed.

ELEPHANT AND SMALL GAME IN BURMA.

4th January.

Commander Newport, Mr. Petrie, Mr. Foster.	at Mandalay	28 Snipe.

4th January.

Admiral Halsey, Mr. Petrie, Commander Newport, Mr. Thompstone.	at Mandalay	119 Snipe.

6th January.

Sir G. deMontmorency. Col. O'Kinealy.		25 Snipe.

7th January.

H. R. H., Col. Harvey, Commander Vibart.	Mandalay	85 Snipe.
Lord Cromer, Lord Louis Mountbatten, Mr. Thompstone.	Mandalay	46 Snipe.

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* One of Lord Louis Mountbatten's Black Buck measured 26½."

† H. R. H. the Prince of Wales accounted for 65 birds.

Admiral Halsey, Mr. Petrie, Sir G. deMontmorency, Col. Pringle.	68 Snipe.
Commander Newport, Mr. Laidlaw.	29 Snipe.

On January 2nd a party consisting of Capt. Dudley North, Capt. Piers Legh, Sir Godfrey Thomas, Capt. Metcalfe, Capt. Poynder and Capt. Ogilvy left Rangoon for Mandalay *en-route* for Upper Burma. They arrived at Mandalay early on the 3rd, and embarked on a steamer to go up the Irrawady. There were three different places at which to shoot and the party was split up as follows :—

Capt. Metcalfe and Capt. Ogilvy.

Capt. Poynder and Sir Godfrey Thomas.

Capt. Dudley North and Capt. Piers Legh.

The elephant shooting party returned on the 8th, spending that night in Mandalay and reached Rangoon on the morning of the 10th.

Bag.

Capt. the Hon'ble Piers Legh ..	1 Elephant.
Capt. E. D. Metcalfe at Ingadi ..	1 „
Capt. F. S. Poynder	1 „
	3 Elephants.*

There were six guns in three parties in the Mogok (Ruby Mines) District. Two guns disembarked at Ingadi and Singu ; the remainder at Thabeitkyin, the terminus of the Ruby Mines road. In each case jungle was very thick, teak and bamboo being predominant, with some fine timber and spear grass. Fresh tracks of Tsaine and Bison were found in large quantity, but the density of the undergrowth and the consequent noise prevented close approach. At this time of the year, although there was an immense amount of game in the jungle, it was impossible to get up to it, owing to the leaves on the ground being so dry, and it was impossible to track properly. After a long trek, just as the sun was going down on the 5th of January, Sir Godfrey Thomas flushed a bull Tsaine who gave a bellow and was off. Later, when hot on the bull's track, he saw two herds of Tsaine. Then darkness came on.

Capt. Ogilvy had a shot at a Bison, but again in such dense jungle that a certain sight could not be obtained. Capt. Legh got a fine tusker elephant (solitary) and his trackers flushed two large bull bisons. They were within a 100 yards of him when he was inspecting a kill.

On the 7th of January Capt. Poynder got a medium size Tusker (solitary), and killed him with one shot between the eye and the ear.

Sir Godfrey Thomas who started at 5-30 a.m. had a very hard day. He came across fairly fresh tracks and some quite fresh Sambhar blood. It was a sambhar that had been chased and attacked by wild dogs.

Capt. Metcalfe got a small tusker out of a herd and he took a dozen rounds to finally kill it. Large numbers of barking deer were very common and were often seen. Tracks of many sambhar were also found, and the jungle was full of monkeys—mostly Gibbons.

Writing about these shoots Mr. V. H. T. Fields Clarke says—

" Capt. Ogilvy and I had 4 fairly strenuous days. The first day we went out after bison, but did not come across any sufficiently fresh tracks. The

*Capt. the Hon'ble Piers Legh's Elephant tusks weighed 20 lbs. and 21 lbs. respectively. Their length from root to tip along the curve was 3'-6" and 3'-5" respectively. I did not have the opportunity of examining Capt. Metcalf's or Capt. Poynder's Elephant tusks.

second day we went out after Saing, but could not find the herd. The jungle was very dry and bad for shooting generally. On the third day news of the fresh tracks having been brought in the day before—we followed the tracks of a solitary bison till about 3 p. m. when we came on the animal in dense young flowered bamboo jungle. Capt. Ogilvy got a shot, but where he hit we could never decide—anyhow it was not in a vital spot. The next day we followed up the animal again and although we were close behind it, it knew it was being followed and kept ahead of us. This day we left camp at 5 a.m. and did not get into Singu till 11 p.m. and must have done all told the best part of 30 miles."

The party covered more than 65 miles in three days ; mostly climbing, too, through very fine jungle. The hills there went up to 3,900 feet.

SNIPE SHOOTING AT MADRAS.

14th January	by a party of members of the staff ..	65 Snipe.
17th January	„ „ „ „ „ ..	44 „
21st January	„ „ „ „ „ ..	21 „
	Total bag ..	65 couple.

This was very interesting shooting because the snipe were mostly in bushes. There was no water and the shooting was mostly overhead.

BLACK BUCK SHOOTING IN INDORE.

2nd February.	
Capt. Dudley North, Capt. the Hon'ble Piers Legh and Capt. Ogilvy	1 Black Buck.
3rd February.	
Capt. Dudley North, Capt. Piers Legh, Sir Godfrey Thomas and Commander Newport	2 Black Buck.
Total bag ..	3 Black Buck.

The shoot on February 2nd was an ordinary stalk on a flatish plain. There were a great many buck, but at first no one could get near any of them. A pack donkey was conscripted and then Capt. Dudley North shot a buck.

On February 3rd the party motored out from Indore about 8 miles where they found bullock carts. Sir Godfrey Thomas got his buck after going about three quarters of an hour. There were a lot of herds about. Commander Newport also got a buck. The name of the district where shooting took place on both occasions was Bijasani (one of the State preserves).

RIFLES AND GUNS USED BY H. R. H. THE PRINCE OF WALES AND SOME MEMBERS OF H. R. H.'S STAFF DURING THE SHOOTS IN INDIA.

RIFLES—H. R. H. THE PRINCE OF WALES, K.G., M.C.

1. One ·400 bore express double barrel rifle No. 21906 by J. Purdey and Sons, London. Barrels made of Sir Joseph Whitworth's fluid pressed steel, taking 47 grains low pressure Cordite and 230 grains bullet

2. One ·400 bore express double barrel rifle by J. Purdey and Sons, London, taking 3″ case, 47 grains low pressure Cordite and 230 grains nickel base bullet.
3.* One ·280 bore single barrel high velocity magazine rifle by Chas. Lancaster, No. 13097, taking 52 grains powder and 160 grains hollow bullet.
4. One ·450 bore rifle supplied by H. H. the Maharaja of Udaipur.
5. One ·470 bore rifle supplied by H. H. the Maharaja of Udaipur.

SIR GODFREY THOMAS, C.V.O.

1. One ·450 bore rifle by George Gibbs.
2. One ·280 bore Ross single barrel magazine rifle. Property of Lt.-Col. R. D. Waterhouse, C.B., C.M.G., Buckingham Palace.

CAPT. DUDLEY NORTH, C.M.G., C.V.O., R.N.

1. One ·470 bore double barrel rifle by Gibbs. (Shot tiger and rhino in Nepal with this). This rifle was used by H.R.H. when he shot his Rhino.
2. One ·286 bore Mauser magazine rifle for Chinkara, etc. (Probably this is a mistake and ought to read ·256 bore Mannlicker Schonauer.)

CAPT. F. S. POYNDER, M.V.O., M.C.

1. One ·470 bore double barrel high velocity rifle by Chas. Boswell, charge 75 grains Axite and 500 grains bullet.
   This was a first class all round weapon which could not be bettered.
2. One ·350 bore single barrel automatic rifle by Remington Arms Co. firing 200 grains bullet. Little used on this tour, but an efficient light rifle. Not recommended for normal all round use owing to delicate mechanism being likely to jam under unfavourable conditions of sand, etc.

Capt. Poynder could not speak too highly of No. 1. He shot a tiger and an elephant each with one shot killing them instantly. It is very powerful. not too heavy to be portable and hits like a sledge hammer.

CAPT. E. D. METCALFE, M.C.

1. One ·450 bore express rifle.

LORD LOUIS MOUNTBATTEN, M.V.O., R.N.

1. One ·450-400 bore double barrel high velocity rifle by Watson Bros. For Tiger and Rhino.
2. One ·375 bore rifle by Watson Bros. for Buck and Gazelle.

H. R. H. THE PRINCE OF WALES.

GUNS.

1. Two 16 bore double barrel guns by J. Purdey & Sons, London. (Made of Sir Joseph Whitworth's fluid pressed steel).

CAPT. F. S. POYNDER.

1. One 12 bore double barrel hammerless gun by Francis Scott, Birmingham.

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* H. M. the King in 1911 used the same type of rifle in Nepal.

I am very much indebted to different members of H. R. H. the Prince of Wales' staff whose names appear in my notes and to all who took part in the shoots for the help and encouragement they have given me in compiling these records, especially to Sir Geoffrey de Montmorency, who most kindly read through the final proofs for me. The authorities in Nepal, in particular General Kaiser Shumsher Jung Bahadur and Col. O'Connor, also helped me very much, and it is through the kindness of Col. Samar Shumsher, a nephew of the Maharaja, that some of the photos are published. But most of all I am grateful to Col. Burton, a big game hunter of great experience with whom readers of the Journal are familiar for his valuable advice and criticism, and my colleague Mr. Prater, who with his ever ready good nature, and his great experience, gave me most valuable assistance both as regards the editing and final arrangement, and the selection of material from a mass of rough field notes. I regret that exigencies of space, and the not-to-be-forgotten question of expense, has prevented me from publishing a large number of illustrations of the Nepal shoot (and other shoots mentioned in the narrative), from the photographic records in my possession.

In a future number of the Journal will appear a report drawn up by Messrs. Hinton and T. B. Fry of the British Museum regarding recent Natural History collecting in Nepal. This collecting work was conducted by Lt.-Col. R. L. Kennion with the assistance of the Society's collector N. A. Baptista, and the report deals with the physical configuration of Nepal, so that in this article I have not dealt further in the matter of describing the country.

Bombay Natural History Society,
12*th June* 1922.

NOTES ON NEW AND RARE INDIAN DRAGONFLIES.

By

Maj. F. C. Fraser, I.M.S.

(*With 2 Text Figures.*)

1. Hemicordulia asiatica, Selys.

Up to the year 1918 this rare dragonfly was only known from 2 males both of which had been taken in Assam. In the year mentioned whilst going over a collection of specimens sent from the Agriculture Institute, Pusa, I found a pair of these insects which had been taken some time before by Mr. Bainbrigge Fletcher at Shillong and had remained in the Pusa collection for some time unidentified.

Mr. Fletcher on his next visit to Shillong took a number of specimens both male and female on the Ward Lake and has sent me others since.

It was thought that the insect was localised to the N. W. until this year when I received a letter from Mr. Bainbrigge Fletcher who was staying in Kodaikanal stating that he had seen a Corduline on the lake there which much resembled *Hemicordulia asiatica.* He finally secured specimens both by the net and others which he found caught up in spider webs on sedges, on the borders of the lake and on receipt I found them to be true *H. asiatica.*

Mr. Bainbrigge Fletcher in his covering letter, when sending these specimens suggested that the insect would probably be found in the Nilgiris and in this he proved to be a true prophet. Two days after receiving his letter I had occasion to go down to Coonoor and there in a shady lane adjoining Sims Park took my first *H. asiatica,* a male, which was hawking insects up and down the road.

The same day on returning to Ooty I ran down to the lake and immediately saw a male and shortly afterwards several more, hawking along the banks. The insect is fairly common on the Lovedale lake as well as the Ooty lake from August to the 1st November, exuvia being common in September and larvæ not difficult to obtain amongst the grass and sedges lining both lakes.

I hope to obtain information of this insect from the lake in Newara-Eliya, Ceylon, next season and probably also from the lake at Mahableshwar. From the numbers seen it would appear that the insect is more common in the south than the far north.

2. Aciagrion paludensis, sp. nov.

2 males and one female at Masnagudi, Nilgiris, 4,500′; 2 males Avalanche, Nilgiris, 6,500′, Nov.-Dec. 1921.

Male. Abdomen 24 mm. Hindwing 15 mm.

Head. Face, cheeks epistome and lips pale blue with a fine, basal, black line to the labrum and a broad transverse band across the epistome, also black; eyes pale blue except for a broad, black cap on the upper pole; occiput and vertex black, the former with a transverse, oval postocular spot of pale blue on either side connected across the middle line by a narrow band of the same colour.

Prothorax, with a fine pale blue colour anteriorly, the posterior border finely pale yellow and the sides broadly pale blue.

Thorax black on the dorsum marked with narrow, pale yellow, humeral bands; the sides blue marked only by two small, black, linear spots posteriorly; tergum spotted with blue.

Legs white, the extensor surface of femora striped with black.

Wings hyaline, stigma small, equal in all four wings, sepia; postnodal nervures 9 in the forewing, 8 in the hind.

Abdomen pale blue marked with black as follows:—segment 1 with an obdurate, dorsal, black spot separated by a narrow, blue, apical annule from a

dorsal, black, thistle-shaped mark on segment 2. The latter mark connected by a short, narrow stalk to a narrow, black annule at the apex; segments 3 to 7 with broad, dorsal, black stripes connected to apical, black annules and separated from each other by narrow, blue, basal annules ; segment 8 all blue save for a dorsal, black mark shaped like a chess pawn with its apex directed basal. In the *Masnagudi* specimens this spot extends as far as the base but in the specimens from Avalanche it falls far short of it ; segment 9 entirely blue ; 10 with a dorsal, broad, X-like mark of black.

Anal superior appendages very small, foliate, triangular, strongly divaricate, black tipped with white ; inferior appendages small, conical and white.

Female. Abdomen 23 mm. Hindwing 15.5 mm.

Almost exactly similar to the male and differing only by the stouter abdomen, by the 8th segment having an uniformly, broad, black, dorsal stripe, segment 9, a large, basal, triangular, black spot and the 10th all blue. The anal border of the latter is strongly indented and raised into a prominent hump on the dorsum not however cleft on top as in the *Ischnura*. The spine on the ventral, apical aspect of segment 8 is white and very robust.

Hab. The *Masnagudi* specimens were found among sedges along the borders of the drinking water tank, whilst those from the plateau above were found in marshes. They are very conspicuous although so small, by reason of their bright blue colour and can be easily picked out from the more sombre coloured *Aciagrion hisopa* with which they mix. They are smaller and more slender than any of the other species of the genus.

I have seen a pair collected by Mr. Bainbrigge Fletcher at Simla, 23-5-1918, 7,000′, which apparently belongs to this species or is a local race. They differ only in having 8 instead of 9 postnodal nervures in the forewing, and the marking on the 8th segment which in the male is a plain wedge of black tapering from the apex of the segment to its base and unidented on its sides.

From *hisopa* and *tillyardi* the species may be distinguished by the fewer postnodal nervures and also by the 8th abdominal segment bearing a black marking (immaculate in the two species mentioned).

3. Anaciæschna donaldi, sp. nov.

As the description of this new species is shortly appearing in " Indian Dragonflies ", I refrain from here giving it in detail. Shortly it may be described as an *Anaciæschna* of the size and bulk of *Anax immaculifrons*, with the wings deeply and uniformly enfumed from base to apices and with the general colouring of the body, dark warm brown marked with brilliant apple green. It is one of the largest and finest of the Indian dragonflies so far discovered.

Mr. Bainbrigge Fletcher sent me a painting made by his wife of this insect from Kodaikanal this year and from it I was able to recognise an insect which I had had in my possession since 1908 in which year I had taken it at Kodai. (The note on the packet stated that the insect's colours were dark brown and bright apple green, but the colours had so faded that I was unable to make out any such markings, and so was reluctant to publish the species until I had more reliable data). A few days later I took a female of the same insect on the Ooty lake and a week later received another female from Mr. T. Hearsey from Yercaud. Between the three of us we secured 6 females and saw probably another 6 (also females). Both Mr. Hearsey and Mr. Fletcher believe they have seen the males flying swiftly near the lakes, but I have not been as fortunate and up to date the whereabouts of the male and its appearance remain a complete mystery. I have recently found the larvæ of this insect in considerable numbers in the Lovedale lake, Ooty, and both Mr. Bainbrigge Fletcher and myself have found a number of exuvia. The venation on the wing covers of these latter has been very distinct and very easy to decipher. Quite a number of the exuvia and larvæ obtained are males so their scarcity is hard to explain. Adjacent jungles have been searched in vain and the ponds have been visited at dusk in the hope that

the insect might be a night-flyer as is its cousin *A. jaspidea*, but all in vain. During the past week I have found it breeding in marshes at Avalanche, Nilgiris, and such spots are probably its natural habitat as all standing waters in these and the Palni Hills are artificial and of comparatively modern formation. I have now a large number of larvæ and should be able to breed out some males in the next few months thus settling the identity of this puzzling insect.

4. Gynacantha o'doneli, sp. nov.

A single male from Hasimara, Duars, Bengal, collected by Mr. H. V. O'Donel.

Male. Abdomen 41 mm. Hindwing 39 mm. Anal appendages 4 mm. Closely resembles *G. millardi*, Fras., from Poona and Malabar, but differs from it by the 3rd segment being more constricted, by all four wings being uniformly enfumed and by its much smaller size which is equivalent to *G. saltatrix*, Martin. The relative sizes of abdomen and hindwing are however different, being 42-35 in *saltatrix* to 41-39 in *o'doneli*, and the dark T-shaped marking on the upper surface of the frons is absent in the latter.

The thorax is an uniform, olive green, paler below and with no traces of humeral bands.

Legs very pale brown with black spines.

Abdomen olivaceous green and brown marked with darker brown and black. apical rings at and towards the end of the segments. The first 2 segments are largely olivaceous green especially on the sides. The oreillets are large and robust and bear 5 to 6 robust spines on the posterior border.

Wings (very ragged in this specimen) deeply enfumed; nodal index:— $\frac{13\text{–}22 \mid 18\text{–}13}{16\text{–}14 \mid 15\text{–}15}$; trigones with 5 cells; hypertrigones traversed four times; 4-5 rows of cells between *Rspl.* and *Rs.* 3-4 between *Miv.* and *Mspl.*; membrane absent; anal triangle of 5 cells; stigma dark golden brown, over 3-4 cells braced.

Anal superior appendages long and slender, almost straight on the outer border, a little dilated after the 1st quarter inwardly, fringed with long hairs. black and inwardly directed and meshing with those of the other appendage, Inferior appendage triangular, nearly half the length of the superiors.

5. Amphithemis nigricolor, sp. nov.

One pair from Hasimara, Duars, Bengal, collected by Mr. H. V. O'Donel.

Male. Abdomen 23 mm. Hindwing 23 mm.

Head. Labium, labrum and epistome creamy white; frons and vesicle metallic blue; occiput black. Eyes reddish brown.

Rest of body, thorax, abdomen and legs matt black, except abdominal segments 2 and 3 which are quite white with pruinescence. There is also some slight pruinescence on the tergum.

Wings hyaline; stigma narrow, very dark brown, non-braced, over about 2 cells; extreme bases of wings slightly saffronated; membrane very small, cinereous; 2 rows of cells in the beginning of the discoidal field; trigones entire; subtrigones traversed once as also the hypertrigones; *Mspl.* absent; 1 cubital nervure to the forewings, 3 in the hind; nodal index $\frac{8\text{–}11\text{—}12\text{–}8}{9\text{–}9\text{—}10\text{–}7}$; the base of the hindwing very narrow, bevelled sharply off, no vestige of a loop.

Anal superior appendages resemble those of *A. vacillans* in shape, but the superior are only slightly longer than the inferior.

The abdomen is very slender, cylindrical and of even length throughout.

Female. Abdomen and hindwing 23.5 mm.

Very similar in shape to the male but slightly stouter and without its dainty elegance. The wings are broader, especially the hind where a distinct loop of 7 cells is found.

ON INDIAN PARASITIC FLIES.

BY

HAROLD RUSSELL, F.L.S., F.Z.S.

II

With Two Plates

(*Continued from page* 380 *of this Volume.*)

III.

THE MUSCOIDEA.

The next five families that must be mentioned in connection with parasitism and Diptera (*Tachinidæ*, *Dexiidæ*, *Muscidæ*, *Sarcophagidæ* and *Œstridæ*) all belong to the super-family Muscoidea of Townsend. It is very noteworthy that this Muscoidean stock has developed three separate and absolutely distinct types of parasitism, or at least feeding, on mammals. * All three have the same aim, which is to nourish the dipterous larvae at the expense of the Mammalia. What is interesting is that each of the three has attained the same result in such fundamentally opposite ways.

1. In the first group come *Cuterebra* (*Œstridæ*) and its allies. The end is attained by subcutaneous or internal larval endoparasitism. The larva does all the feeding and the imago takes no nourishment whatever. To such a complete extent does this prevail that the adult mouthparts are atrophied and do not function at all. The Oestrid habit of parasitism seems to be the oldest of the three.

2. In the second division we have *Glossina* (*Muscidæ*) the genus which includes the tse-tse flies. The same result is attained by supracutaneous imaginal blood-sucking which strictly speaking is not ectoparasitism. This is the exact antithesis of the preceding. The adult fly does all the feeding by blood-sucking. But it retains and nourishes the larva within the oviduct until full grown. The larva is then extruded and almost immediately becomes a pupa without feeding any more.

3. In the third division we have the case of the Congo floor-maggot (*Auchmeromyia*), another of the *Muscidae*. The fly produces a blood-sucking larva. The desired result is here obtained by supracutaneous larval ectoparasitism. It is a remarkable method because unique among dipterous larvae. The larva sucks blood ex-

* C. H. T. Townsend. "The Taxonomy of the Muscoidean flies 1908) Smithsonian Miscellaneous Collections. Vol. 51.

ternally by mechanical means. It pierces the skin of sleeping persons with its small sharp jaws and imbibes their blood. The habit is without parallel among Diptera. The larva is a footless maggot with very minute jaws and cannot attach itself to the skin of the host except by the mouth-parts. It cannot cling whilst piercing by any structure except the mouth-hooklets. Such a habit could hardly have arisen but for the fact that the African natives sleep on mats on the earthen floors of their huts. The larvae, which probably originally fed on foul liquids, are common beneath children's mats which become stained with urine. The adult flies are attracted by the smell and lay their eggs under the mats.

It has been stated previously that the parasitic habit of the *Œstridae* is apparently the most ancient. The *Glossina* habit comes next. The habit of blood-sucking of the Congo floor-maggot is evidently a comparatively recent development. The stages of parasitism can thus be placed in order. In the *Hippoboscidae*, which are imaginal parasites and which will be described in the section on Pupipara, the peculiar mode of reproduction of *Glossina* is carried a stage further. In *Glossina* the larva when extruded has sufficient power of movement to find a suitable place for pupating; thereupon its integument becomes chitinized to form the pupal envelope. The Hippoboscid larva upon extrusion at once undergoes this change; the Hipposboscid female therefore deposits the larva in a situation suitable for it to remain during the pupal period.

The *Hippoboscidæ* are probably an offshoot from the old muscid stock. The *Œstridæ* are possibly an earlier off-shoot in an opposite direction from several stems of the same stock. Townsend regards the *Œstridæ* as a polyphyletic group showing affinities with various sub-families and tribes of Muscoidea. Its preponderating characters are due to similar parasitic modes of life in the larvae with corresponding similarity in the adults. These suggestions are enlightening when one tries to discover the origin of the different forms of parasitism among flies.

J. Pantel in his "Recherches sur les Diptères à larves entomobies" has suggested ten groups of Muscoid flies founded on reproductive and parasitic habits. * These may be compared with the five Tachinid groups of Townsend referred to further on and based also on reproductive habits. Townsend considers that Pantel's

* Two parts of this great and interesting contribution have appeared: I .Caratéres parasitiques aux points de vue biologique, ethologique et histologique. La Cellule (1910) Vol 26 pp. 27-216. II. Les enveloppes de l'oeuf avec les formations qui en dépendent; les dégats indirects du parasitisme (1913) Vol 29 pp. 1-289. Each part contains a bibliography of the literature on parasitism in the Diptera. The earlier part of Pantel's two papers has been reviewed and criticised in English by C. H. T. Townsend: "Review of work by Pantel and Portchinski on reproductive and early stage characters of Muscoid flies." (1911) Proc. Ent. Soc. Washington., Vol 13, p. 151.

grouping becomes in a large measure a true and natural one though not founded on the ordinary taxonomic characters.

The ten groups are as set out below :

1. Species which glue a short flattened macrotype egg to the host's body.
2. Species which deposit on the food of the host a microtype egg containing the developed maggot and destined to be swallowed.
3. Species extruding large and strong larvae known as ordinary flesh maggots.
4. Species which deposit maggots (naked or in choria) in the path of the host.
5. Species which deposit maggots (naked or in choria) probably in the neighbourhood of the host.
6. Species which deposit maggots (naked or in choria) on the body of the host.
7. Species which introduce into the host's body maggots (naked or in choria) by means of separate instruments of perforation and injection.
8. The same but by means of a combined instrument to perforate and inject.
9. Species destitute of incubating apparatus but provided with a variable chitinous ovipositor for introducing the undeveloped eggs into the host.
10. Species which deposit on the host a pediceled egg in which the maggot is already well developed.

Examples of most of these groups will be met with in the five families now to be dealt with.

Tachinidæ and Dexiidæ. The habits and life histories of these two families are so much alike that they can be treated together. The *Dexiidæ* closely resemble the *Tachinidæ*. Willistone considers that the distinction between the two families is very difficult to make, if it be not actually evanescent. Townsend lumps most of the old *Dexiidæ* with the *Tachinidæ*. Both are smallish to fair-sized hairy flies with strong legs and conspicuously large squamae. The habits of the mature Tachinid flies are much the same in all the members of the group which is a large one. They are found on plants and on leaves or flowers which are the haunts of the hosts which they seek to parasitize. So far as is known all the larvae are parasitic in habit and the parasitism is confined to the larval stages of other insects. The individual female Tachinid is not always particular in the choice of the species of larvae which she parasitizes.

In the Muscoidean flies the integument is furnished with many large bristles called *machrochaetæ*. In the *Tachinidæ* this hairiness is most characteristic and is of some interest in connection with their parasitic habits which involve running about and searching for caterpillars. Osten-Sacken has pointed out that these bristles occur

almost solely in flies with pedestrian habits and he concludes that the *machrochaetæ* are organs of orientation which fulfil much the same function as a cat's vibrissae or whiskers. If it be the truth that the bristles on the Tachinid and other flies are connected with pedestrian habits, it is worth noticing in confirmation that in another utterly different animal, namely the three-toed Sloth, whose habits are the reverse of pedestrian, facial vibrissae are absent.

There can be little doubt that parasitism in the *Tachinidæ* is fairly recent and not nearly so effective and well evolved as, for instance, in the parasitic Hymenoptera with almost similar habits. Unlike most of the parasitic Hymenoptera, these Dipterous parasites do not usually confine themselves to one particular host. By far the largest number of species are parasitic on lepidopterous larvae. The lives of some 400 species have been more or less studied. About 70 are parasitic on Hymenoptera. Then follow as hosts : Coleoptera ; Orthoptera ; Hemiptera ; and other Diptera in diminishing numbers.

The precise adjustment of perfect parasitism has not yet been attained by these flies and they make two frequent blunders with disastrous results to their offspring . The first consists in laying eggs on a caterpillar which is about to moult ; the second, in laying eggs on a caterpillar which has been already parasitized, with the result that some or all of the young Tachinids perish of starvation. This points to the comparatively recent adoption of this mode of life. Yet when all is said the Tachinid flies are a successful family. To secure successful parasitism five forms of reproductive habit have been evolved in the *Tachinidæ*. They are thus summarized by Townsend :—

1. Host-oviposition.
2. Leaf-oviposition.
3. Supracutaneous host-larviposition.
4. Subcutaneous host-larviposition.
5. Leaf-larviposition.

These five forms of reproduction are arranged above in order of probable antiquity. The placing of the egg upon the host is thought to be the most primitive, and the placing of the larva on a leaf, where the host will pass, appears to be the most recent stage. From the commonsense view of the habits of these flies this seems natural ; and it is also confirmed by a study of the external characters of the flies.* A few words may be added on each of these five methods of reproduction.

1. *Host-oviposition.* The eggs are laid by the female Tachinid on the caterpillars. The eggs are usually thin shelled and in some

* C. H. T. Townsend (1908) "A record of results from rearings and dissections of Tachinidæ." U. S. Dept. Agriculture. Bureau of Entomology. Tech. Series No. 12 Pt. VI. pp. 95-118.

species on pedicels. The maggots hatch out and penetrate the caterpillars. In some cases the segments of the parasitic maggot's body are furnished with rows of minute spines directed backwards. These help progression over the caterpillars skin and are aids to penetration also. In the second stage of the maggot's life, having served their purpose, the spines for the most part disappear. A very marvellous adaptation appears in the third or penultimate stage. The penultimate stage of many Tachinid maggots presents this strange peculiarity. During the two first stages the maggot derives no air from the outside. In the third stage it protrudes a pointed posterior end through the skin of the caterpillar. The protruded end becomes highly chitinised from exposure to the air and ends in a pointed tube in the base of which lie the posterior stigmata. Through this protruded tube the maggot obtains air. The fourth and last stage of these maggots is passed living free inside the hosts. The cast skins of the penultimate stage remain fixed in their place protruding through the caterpillar's skin. A few species remain as last-stage maggots within the chitinised cast skin and transform to pupæ inside the caterpillar skin. Most Tachinids pupate outside the host and the exit is fatal to the host.

2. *Leaf-oviposition.* The suggestion that the parasitic maggot could obtain entrance into the host by the egg in which it is enclosed being swallowed by the caterpillar, was received with incredulity when originally put forward. The facts are now well established. The eggs are swallowed by the caterpillars and hatch within their alimentary canal. In such cases the eggs are minute, perhaps not a fiftieth part of the usual size, though the flies laying them may be larger than the average size. The piece of leaf swallowed by the caterpillars may be six or eight times the size of one of those eggs. Where a fly produces minute eggs it is certain that when matured they will be black and highly chitinised. They are intended to stand exposure and swallowing. Probably such eggs when deposited on leaves can retain their vitality for a long while. Probably also they are not laid until the embryo is well developed ; the digestive juices and the conditions in the alimentary canal act on the chitin, weaken the shell and release the maggot. It is certain that somehow the egg must hatch within a few hours of being swallowed else it would pass through the gut of the caterpillar and perish. A very small egg cannot have a thick chorion and is therefore provided with a chitinised thin one which withstands atmospheric conditions better than an unchitinised thick one. Some eggs are protected by a reticulated surface which possibly preserves them from injury in the swallowing. Thus the history of the species can be read from the uterine eggs dissected from the female Tachinid.

3. *Supracutaneous host-larriposition.* This brings us to another

phase of Tachinid parasitism but the leap from reproduction by living larvæ is not so abrupt as it may seem. There are species of *Tachinidæ* in process of transition. Female Tachinids of certain species may deposit eggs almost undeveloped, or at any stage of the development of the embryo, or may even perhaps deposit living maggots. When the larva is deposited on the skin of the caterpillar it is exposed to much the same danger as an egg; it may be accidentally or purposely removed by the caterpillar and if the host moults before the maggot has managed to penetrate this is fatal.

4. *Subcutaneous host-larviposition.* Another step forward is attained if the parasitic maggot can be immediately introduced beneath the host's skin. The females of those Tachinids which have attained this higher grade of efficiency are furnished with a long curved sheath which tapers down to a point and is microscopically fine and sharp. The ovipositor fits into the base of this organ and with this organ the female Tachinid punctures the caterpillar's skin at the moment when the living maggot is being extruded. Until Townsend and his assistants worked at this group (1908) the habit of introducing the living maggot within the skin of the host was never suspected in the *Tachinidæ*.

5. *Leaf-larviposition.* It is unexpected to discover that Tachinid parasitism reaches, apparently, the highest efficiency in those forms which deposit their maggots on leaves to wait the passing by of a chance host. The maggots, in a fashion wonderful to relate, are securely attached to the surface of the leaf at the moment of birth by a membranous cup-shaped case which holds the posterior end of their bodies. The maggot can reach out in all directions and moves constantly on feeling the proximity of a host. When undisturbed it lies at length on the leaf but on being touched it becomes excitedly active seeking to attach itself to the expected host. No sooner does it lay hold of a caterpillar than it is torn from the cup-shaped attachment by the motion of the caterpillar and its own exertions.

It would be thought perhaps that the chances of parasite and host meeting under such conditions were very remote. But this is not the case, for the Tachinid female selects leaves and stems where caterpillars have already crawled and usually deposits a maggot where a silken thread has been left by a caterpillar. Possibly the sense of smell guides the flies in selecting these silken threads. In such a case, where the caterpillar follows the thread back, it is sure to pick up the maggot on the way.

A second advantage is gained by this habit in the greater certainty with which a maggot can become attached to a caterpillar especially if one of a hairy sort. Being placed where the caterpillar will pass *over* it, the maggot can attach itself with greater ease to the under parts where hairs are sparse and short. If the female Tachinid tried to

deposit it on the back of the caterpillar it would be much less certain of securing an attachment. The alarming size of the fly, the consequent frantic efforts of the caterpillar to shake off the maggot and the hairs which protect the back and sides of the caterpillar with an almost impenetrable thicket, are thus circumvented.

The maggots of this group are protected by a thicker and darker integument than the usual white and thin-skinned forms, since they have to pass a time exposed to the atmosphere.

Tachinids form an enormous group of parasitic flies with wide geographical distribution. Over 300 genera have been established. Classification and nomenclature are in a state of flux. The Indian species have hardly been studied at all and must be very numerous.* Here is a rich and almost virgin field for Indian collectors and observers.

Muscidæ and Sarcophagidæ. Although most of the species in these two allied families are not parasitic at any stage of their existence, others are always or occasionally parasitic as larvæ, and a few are blood-suckers in the adult stage. The frontier which divides these two families is undetermined. The Muscoidea are of extremely recent evolution: in fact their evolution is still going on. In these two families we can see parasites in the making. It has already been pointed out that a promiscuous choice of hosts is evidence, and indeed a necessary result, of the recent origin of the parasitism. No fixed habits comparable with those of the Hymenopterous parasites are to be found in any parasitic Muscoidea except the *Œstridæ*.

Muscidæ. To this family belong the only blood-sucking Cyclorrhapha, other than Diptera pupipara if these latter are to be regarded as one of the cyclorrhaphous sections. The blood-sucking Muscids, which as everyone knows, are well represented in India, belong to the three sub-families following:

(1) *Philæmatomyinæ:* with a single genus and three species all Indian.

(2) *Stomoxydinæ:* with some six genera and many Indian species.

(3) *Glossininæ*: with a single large genus: the African Tse-tse flies.

These three blood-sucking groups contain perhaps some potential or embryo parasites. The pupiparous habit is highly developed in the last of the three; and it is but a step to the *Hippoboscidæ* with a completely parasitic life.

The eggs of the Muscidæ usually hatch in a day but sometimes larvæ

* There is an excellent coloured plate (Plate LXVIII) of some Indian Tachinids, after Van der Wulp's water-colour drawings in H. Maxwell Lefroy's "Indian Insect Life" Calcutta 1909.

F. M. Van der Wulp's "Catalogue of described Diptera from South Asia." The Hague, 1896, mentions under fifty Indian species and is otherwise far from perfect.

are deposited, the eggs having hatched within the body of the parent fly. In this respect the same conditions prevail as in some *Sarcophagidæ* and some *Tachinidæ*. The typical Muscidæ are house-flies, blue-bottles and blow-flies. In the sub-family *Calliphorinæ* there are several grades of parasitism. All the species are oviparous, so far as we know, and usually the eggs are deposited on dead bodies. The stages towards parasitic habits are as follows :—

(*a*) Some flies will occasionally lay their eggs in sores on the skin of living animals where the larvæ can feed on the juices that surround them. The larvæ of *Calliphora vomitoria* L. a common European and American member of the blue-bottle genus, occasionally cause cutaneous myiasis in man and animals. The allied *C. erythrocephala* Macq. is found in North India and may sometimes have the same habit. *Lucillia serenissima*, Fabr., a greenish medium sized fly common about the meat stalls at bazaars in South India, as a rule deposits its eggs on dead meat. Occasionally it will oviposit on sore places in the skin of sickly cattle. This often happens during outbreaks of foot-and-mouth disease in Madras.

(*b*) The next stage begins where this has become the regular habit as is the case with many species belonging to several genera. *Pycnosoma* is a genus to which belong the Oriental representatives of the genus *Chrysomyia* which in tropical America cause serious myiasis in men and beasts. They are thick-set insects with characteristic red cheeks. *P. flaviceps*, Walk., a well known species in South India, deposits its eggs in the nostrils particularly of human beings and camels. The female flies are attracted by foul breath. The larvæ penetrate within the nasal and frontal sinuses producing ulceration, fever and sometimes death.

(*c*) The latest stage of parasitism is the blood-sucking maggot. The two genera *Auchmeromyia* and *Chœromyia* which have developed this habit are both African. The Congo floor-maggot has already been referred to. The larvæ of *Chœromyia* inhabit the lairs of wart-hogs and aard-varks whose blood they suck.

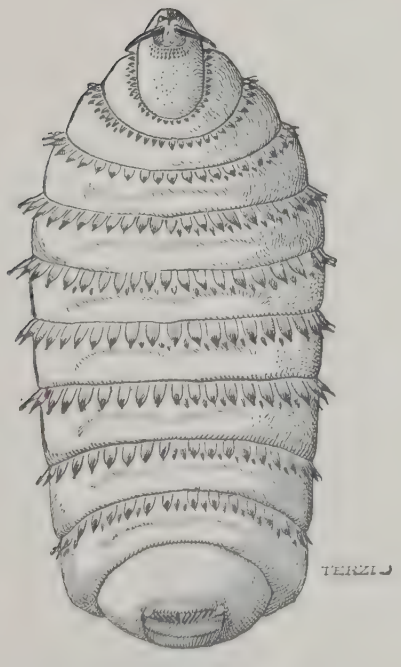
Sarcophagidæ. The flesh-flies, as they are commonly called, are a family of few genera but there are many species and they are difficult to distinguish. The larvæ sometimes live as parasites in wounds and sores causing dermal myiasis. They have also been discovered in the nasal cavities of man and other mammals. Whether this is one of the regular reproductive habits of definite species is not certainly known. The genus *Sarcophaga* is sometimes and perhaps habitually larviparous. These larvæ have been found living in the stomachs of frogs and under the skin of turtles. The larvæ of several species have been also found in snails, beetles, grass-hoppers and in the larvæ of moths.

These flies are common all over India. They may be recognised

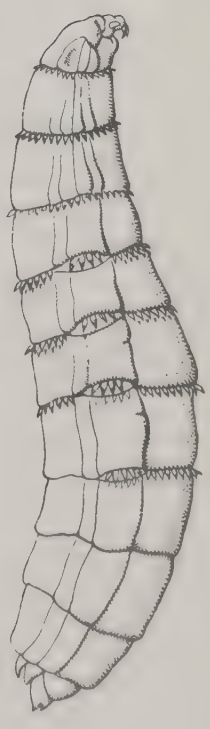
5

6

6A



6B



INDIAN PARASITIC FLIES.

5.—*Conops erythrocephala*, Fabr. ♀. x 4.

6.—Larva of *Gyrostigma sumatrensis*, Brauer. (After Bau.) x 2¼.

6A.—Larva of *Gastrophilus equi.*, Clark. x 3.

6B.—Larva of *Cobboldia elephantis*, Cobbold. (After Bau.) x 3.

by their red eyes and grey thorax striped longitudinally with black. They are thick-set flies of moderate size and frequent the neighbourhood of decaying animal and vegetable matter. The known Indian species nearly all belong to the genus *Sarcophaga* and the commonest Indian species is probably *S. lineatocollis* Macq. In Gujarat it is not uncommon to see large sores on the human scalp full of the larvæ of a species of *Sarcophaga ;* whether such larvæ truly deserve the name of parasites depends on how far this method of nutrition is an established and regular habit.

Œstridæ. The flies of this family are sometimes included among Calyptrate Muscoids but are best regarded as a distinct group which has arisen from several Muscoid types and now is much specialised for a parasitic life. They form a small and well defined group with about seventy or eighty described species scattered over the world. The larvæ are always parasitic on mammals and on mammals only. The hosts of the Indian species are horses, sheep, cattle, elephants, rhinoceroses and camels. The note-worthy feature in the life history of an Œstrid fly is that feeding is confined to the larval stage. This is the parasitic period when the growing insect lives surrounded by nourishment.

Parasitism of the larval insects takes three principal forms. We have parasities (1) in the food canal, (2) in tumours formed by the larvæ under the skin, and (3) in the normal cavities of the nose and throat. It is a general rule, with but few exceptions, that each species of Œstrid fly is confined to a single species of mammal ; and allied species of fly are parasitic in the same fashion upon allied mammals. The adults are free-living, large, hairy flies, which take no food and exist only for procreation of their species. The adult fly has a minute mouth and often such atrophied vestiges of mouth parts that it is incapable of taking any food. Nevertheless some of these flies live for three or four weeks and display great activity.

Brauer classified the *Œstridæ* according to the combined characters of the larvæ and the perfect insects*. He divided the typical Œstrids into three groups, which coincide with a classification based on the parasitic habits of the larvae. His three divisions are the following :—

1. *Gastricolæ.* Larvae found in the stomach and gut of Equidae (Horses, asses, etc), *Rhinocerotidæ* (rhinoceroses) and *Proboscidea* (elephants). To this group belong *Gastrophilus*, *Gyrostigma* and *Cobboldia* which are all three Indian genera.

* Professor Friedrich Brauer of Vienna brought out his monograph in 1863. *Monographie der Œstriden*, by Friedrich Brauer. Wien, 1863. It was an epoch-making work and contains a complete bibliography of all the literature on the Œstridæ up to that year. It is still a standard authority in spite of much recent work on the group. See also "*Nachträge zur Monographie der Œstriden*", *Wiener Entom. Zeitung*, (1887) vol. VI., p.4. by F. Brauer.

2. *Cavicolæ*. Larvæ found in the frontal sinus, nasal cavity and throat of *Covicarnia* (cattle, sheep and other hollow-horned ruminants). *Tylopoda* or camels, *Cervidæ* (the deer family), *Proboscidea* (elephants). The Indian genera are *Œstrus* and *Cephelomyia*.

3. *Cuticolæ*. Larvæ found under the skin of *Cavicornia*, deer, the horse family and rodents. *Hypoderma*, so far as I can discover, is the only recorded Indian genus. This is the group to which the warble-flies belong.

Brauer enumerated sixteen genera in the whole Œstrid family and about half a dozen more have been established since his day. The adult flies belonging to this family are not difficult to recognise. They are fairly large and thick-set flies with big heads, of which the lower part is inflated, giving a sturdy appearance. The short, three-jointed antennæ are sunk in the front of the head and hardly visible. The compound eyes are not prominent, and there are also ocelli, or simple eyes. The abdomen is short, conical and often hairy, somewhat like that of a bee. The veins in the wings are like those of house-flies and others of the Muscid stock, from which the Œstrids are doubtless descended. The second pair of wings (as in all Diptera) are represented by small balancers called halteres. In many Œstrid flies the halteres are protected by scales, usually large, which are known as squamæ or tegulæ.

Much controversy has raged as to the manner in which the larval parasites reach their abiding place in the host's body. It is now generally believed that the eggs, or young larvæ, are, with some possible exceptions, taken into the mouths or nostrils of the animals which they infest, and so proceed, respectively, into the stomach, nose, throat and frontal sinus, or bore a way through the tissues of the body to the skin.

1. *Gastricolæ*.—The genus *Gastrophilus* has many species and a world-wide distribution. All are parasites of horses, wild asses and zebras. These flies are therefore restricted as regards geographical distribution by that of the *Equidæ*. Several species are common wherever men keep horses, and their larvæ are the horse-bots well known to grooms and veterinary surgeons. *Gastrophilus equi* Fab. one of the typical species is widely distributed in India. The female buzzes about horses during the hot hours of the day. Hovering a moment, she deposits a yellowish conical egg which adheres, like the nit of a louse, by its narrow end to the hair. This egg remains securely attached, owing to a viscid matter which is deposited at the same time. The fore legs, which are most accessible to the horse's tongue, are as a rule the parts selected. The flies are somewhat hairy, with fawn-coloured faces and blackish thorax. The abdomen is mottled yellow, with darker brown irregular blotches. The abdomen of the female ends in a long ovipositor, which is doubled beneath

the body when at rest. Though hundreds of eggs may sometimes be seen glued to the hairs of a single horse, the future host does not seem to be troubled by the performance. Hatching follows after a few days. Perhaps it is the itching caused by the larvæ which makes the horse lick the places. On reaching the alimentary canal, the parasites travel down and ultimately attach themselves by their mouth-hooks to the stomach wall. The place of attachment is marked by a depression, and the head of the larva becomes more and more deeply plunged into the mucous membrane. During this parasitic stage, which lasts ten months to a year and includes two moults and three stages of larval growth, the larvæ feed on the inflammatory products which exude from the minute wound. After the bots are detached from a horse's stomach the pitting remains.

The body of the Œstrid larva consists of twelve segments, of which the first two cannot be differentiated from the cephalic ring. No head can be recognised. The antennæ are rudimentary membranous papillæ. The problem of respiration during the parasitic time in the host's stomach presents difficulties which are, however, successfully solved. On reaching maturity the larvæ let go their hold and pass out of the horse's body with the droppings . The larvæ are then whitish oval maggots, about 20 millimetres long, with rows of brownish spines. They are at first lively, but soon burrow into the horse-dung or the earth, and there turn into rigid, dark-brown shiny pupæ. This stage lasts a month or more. The fly emerges by forcing open the lid of the puparium, and the life-cycle begins once more.

Indian elephants are the hosts of Œstrid larvæ which attach themselves to the stomach walls and go through stages of development similar to those of the horse-bots. The flies belong to the genus *Cobboldia*. The parasites of Asiatic elephants are probably of a different species from those which attach themselves to African elephants. The Indian insect, *Cobboldia elephantis* Cobb., is known, and is a large fly with conspicuous reddish head, black wings and body, marked with startling white spots at the base of each wing. Eggs of flies have often been observed in the erosions at the roots of elephants' tusks. It may be that this is the usual spot chosen by the Œstrids to deposit their eggs. Since elephants do not lick their fore-legs or flanks like horses, a spot near the root of the tusk gives the newly hatched larvæ the best likelihood of making their way into the gut of the proboscidean. The mature larvæ, which have long been known in the stomachs of elephants, are much larger than horse-bots, though of the same type. Their mouths are furnished with only a single pair of strongly curved hooks which act as formidable organs of attachment to the stomach membrane.

The history of our knowledge of this parasite of the elephant is interesting. Cobbold collected the first larvæ from Indian elephants

which succumbed to an epidemic in Sanger's Circus. Dr. Livingstone, the explorer, subsequently sent home specimens from African elephants. Brauer's own account of how he reared the first known flies from larvæ obtained from the dung of some newly arrived Indian elephants in the Imperial Austrian Menagerie at Schönbrunn is a delightful tale that may be recommended to all dipterologists.*

In this group of Œstrids there remains to be mentioned the genus *Gyrostigma*, which is parasitic on rhinoceroses. The larvæ have been obtained from the stomachs of two species of Asiatic rhinoceros namely *R. sumatrensis* and *R. lasiotis*. They resemble in most characters the *Gastrophili*, or horse-bots, but are larger. Since both species of African rhinoceros are the hosts of allied Œstrid larvæ it would be surprising if the rhinoceroses of the Indian peninsula were exempt from these parasites. Sportsmen who have an opportunity should examine the stomach walls of newly killed rhinoceroses and should detach the larvæ, if they are found, without injuring them. They should be preserved in alcohol.

Elephants, as is well known, are ancient types of mammal which have long existed on the earth. The evolution of mammalian host and insect parasite must have proceeded simultaneously during the long ages of the earth's history. *Cobboldia*, the elephant parasite, is therefore of special interest. The imago is a synthetic type which unites the characters of almost all forms of genuine Œstrid flies. The origin of the elephant is lost in the obscurity of geological ages, whilst the horse and the rhinoceros are both more recently evolved types of mammal and allied to one another. It is also significant, when we appreciate the relationship of the hosts, that the parasites of the horse and the rhinoceros belonging to the Œstrid genera *Gastrophilus* and *Gyrostigma* respectively are closely related. The deduction which may be drawn from these facts is that the parasitism of Œstrid flies on mammals is of ancient origin. Host and parasite have evolved into their present form side by side : and where the mammalian hosts are allied, the parasitic larvæ, which live in their stomachs, will turn into more or less closely related flies.

Cavicolæ. This group comprises some fifteen or twenty species of Œstrid flies, whose common characteristic is that the larvæ live in the cavities within the skulls of a variety of mammals. Sheep, antelopes, goats, buffaloes, camels, deer, horses and the African elephant and hippopotamus are the hosts of these remarkable parasites. In many cases only the larva has been obtained and the adult fly is still unknown. Six or seven species of the genus *Œstrus* are known, but the only recorded Indian species appears to be *Œstrus ovis* L. which has been known to man from ancient times. It is said to be

* "Beiträge zur Kenntniss aussereuropäischer Œstriden", by Dr. F. Brauer (1896) Denks. Akad. Wiss. Wien, vol. 64 p. 259.

not uncommon in Bengal. The nasal fly, bot or head-maggot of sheep must have attracted the notice of shepherds in all ages. The fly is now found in all four continents and in Australia, the parasite having, thanks to man, travelled round the world with its host, but whether introduced or indigenous to India is uncertain.

The adult is rather a small fly, but larger than a house-fly, and of a yellowish-grey mottled and hairy appearance. Like other Œstrids, it avoids the shade and loves the hot bright sunshine. During inclement weather it hides and emerges in the warmth, to fly with much liveliness at a great height and to bask on stones heated by the sun. According to some observers the approach of the flies alarms the sheep, who huddle together with heads down and bury their noses in the dust. After being touched about the nostrils by the female fly, they snort and rub their noses on the ground According to other observers, the fly has been seen to settle on the nostrils of the sheep, and to deposit as many as fifteen eggs in succession, without causing any immediate annoyance to the future host.

There has been divergence of opinion as to whether eggs or larvæ are deposited, but there is little doubt that in Europe both habits obtain. It has been suggested that this depends on the weather.* The pregnant female, if the weather is fine, deposits eggs round the sheep's nostril. But if low temperature makes her inactive, the ova develop within the body of the parent during the period of delay. Larvæ are then laid in the sheep's nostrils. The larvæ enter the nasal cavities of the sheep, creep into the frontal and maxillary sinuses, even into those of the horn-cores, and there develop. They pass through the usual three stages of an Œstrid larva. In the first stage they are white and transparent, with a length of 2 millimetres. When they have attained maturity they develop dark transverse streaks, and sometimes attain a length of 30 millimetres. The parasites remain about ten months in these cavities of the head, feeding on the mucus. It is not unusual to find three or four together, and at the suitable season they may be found together in all stages of development. Yet they rarely occasion any morbid disturbance in the host unless they are far advanced in development and exceedingly numerous. During the months of larval growth they attach themselves by their mouth-hooks to the membranous lining of the cavity. On attaining maturity, the larva lets go and creeps about until it passes into the nose, from which it is expelled on to the ground by the violent snorting of the host. There pupation takes place within twenty-four hours. The pupal envelope, at first red, becomes brown and ultimately black. In about a month the perfect fly emerges and another life-cycle begins. So far as is known, the life-history of the other members of this group is somewhat similar. Other species of

* "Note on the Deposition of the Eggs and Larvae of *Œstrus ovis*, Linn.", by Walter E. Collinge, *Jour. Econ. Biology*, (1906) vol. I, p. 72.

Œstrus have been obtained from various wild sheep and from some African antelopes.

An interesting species *Cephalomyia maculata* Wied. is a parasite of camels, and the larval stage is passed in the nose or throat of the host. Both the Bactrian and the one-humped camel suffer from this fly. It is a small species, with thorax mottled yellow and black and abdomen blackish-grey. The head is broad and has a strangely swollen appearance. The wings are small, cut away at the hind margin, and mottled yellow along the anterior border. The halteres are masked by large scales or tegulæ. The larva reaches, when mature, a length of 30 millimetres. It is then sneezed or spat out by the camel. It at once pupates, and, if kept under observation in a box of sand, the fly will be seen to emerge in about fourteen days. This species ranges across North Africa eastwards into India, and is also found in South Europe. It is the only representative of the genus so far discovered. Camels appear to suffer from the presence of the parasite, and during various campaigns in Afghanistan and India the camels in the British expeditionary forces suffered severely. The continuous irritation produced in the nasal cavities and pharynx is followed by snorting and shaking of the head, with much exhaustion and a bloody and offensive discharge from the beast's nostrils. If it should be proved that the same species is also a parasite of such a totally different host as the buffalo (*Bos bubalus*) of Southern Europe and Asia, as has been asserted by some authorities, it would indeed be remarkable. The evidence is not conclusive and it is a general characteristic that Œstrid flies restrict themselves to one host, or, at least, to closely allied species. To find the same form in a camel and an ox would upset many preconceived notions.

3. *Cuticolæ*. Fifteen to twenty species of *Hypoderma* are known, whose larvæ are parasitic on horses, oxen, buffaloes, American bisons, goats, deer, antelopes and musk-deer. The insects are known as warble-flies. Domestic cattle in India are the victims of a Palearctic species *H. bovis*, De Geer, which is nearly allied to *H. lineata*. There is uncertainty as to their exact geographical distribution and whether their life-histories differ to any great extent.* The late Miss Ormerod spent over ten years in collecting the evidence of farmers and hide-merchants as to the injuries to cattle and hides. She estimated that 48 per cent of the hides exported from India were damaged by reason of the holes which the larvæ bore in them. There is little exact information as to the distribution of *H bovis* in India. It seems to be found in Western India from the Punjab southwards probably as far as Gujerat. In Bengal it is confined to the hills. When the female fly approaches the herd of cattle to lay her eggs, the beasts often stampede into the nearest water, where it is supposed the flies

* A good summary of what was known in 1906 was put together by A. D. Imms "On the Life-Histories of the Ox Warble Flies," *Jour. Econ. Biology.*, vol. i., p. 74

do not follow them. This terror is attributed to a shrill buzzing made by the fly. The flies certainly neither bite nor sting the cattel. The female has no instrument, as many parasitic flies have, capable of inserting an egg under the host's skin. Her ovipositor is a flexible tube which opens and shuts in the manner of a telescope.

The flies move with such extreme rapidity that they are difficult to follow with the eye. They are rare in collections. The evidence seems to show that it is through the mouth of the host that the parasites reach the warbles, or subcutaneous tumours, in which they go through the last stages of their larval development. The female is so quick in performing the act of laying that she does not seem to remain on the host for more than a few seconds. The eggs are longish, flattened, white, with an appendage at the base which is perfectly adapted for clasping a hair. A number are often placed on a single hair. The appendage consists of two lobes, which form a bulbous enlargement at the base of the egg, and are attached to it by a thin neck. The lobes close over the hair and give a secure hold as soon as the egg is deposited. The eggs are laid on the backs and flanks of the cattle, perhaps on any spot which the beast's tongue can reach.

Once the eggs are laid, three possible courses have been put forward by different entomologists for the life-history of the parasite between the egg and the warble stage. *First*, that on hatching the larva eats its way through the hide and wanders a short distance in the subcutaneous tissues; eventually it returns to the surface and gives rise to the well-known tumours, in which it lives until the time for pupation arrives. Or, *secondly*, having bored a way through the skin, the larva wanders extensively in the tissues of its host, sometimes reaching the spinal canal and the walls of the œsophagus. Eventually it returns to the surface and completes its development beneath the skin. Or, *thirdly*, that the larvæ never bore through the skin of the host, but are taken into the throat when the beast licks the eggs off its body. Having hatched, the larva slowly bores through the walls of the œsophagus and wanders about the tissues, sometimes reaching the spinal canal through the spaces between the vertebræ. Eventually it reaches the skin as before.

There are grounds for believing that the last is the normal life-history. During the early part of the larval life, growth would seem to be very slow, but the small parasite may wander far and wide through the host's tissues. This is the winter period. Brauer called this stage the *Stillstandstadium*, and pointed out that a similar period of slow growth occurred in other larvæ of the Œstrid family*.

When the eggs are laid, the young larvæ within are already well developed. Sometimes they are licked up with the hair attached and the larva inside, at other times they may have already hatched.

* "Ueber das sogenannte Stillstandstadium in der Entwickelung der Oestriden-Larven," by F. Brauer (1892), *Verhandl. Zool-Bot. Gesellschaft Wien*, vol. 42 p. 79.

In either event the moisture and warmth of the beast's saliva seem to conduce to their development. It is specially to be noticed that the season of egg-laying coincides with the time when the cattle are shedding their coats and have the habit of licking themselves.

The newly hatched larvæ are worm-like, whitish and transparent; they have minute spines over most of their body, which cause them to adhere to the walls of the œsophagus. In that situation they soon moult and assume the smooth stage. In the smooth condition they bore through the œsophagal walls and wander slowly through the host's tissues. This period of migration lasts some nine months, during which period growth is extremely slow. Towards the end of winter, at least in Europe, they make for a point in the region of the animal's back and there penetrate the skin. A second moult then ensues, and the spiny character is once more assumed. Development is rapid and causes much inflammation. As it reaches maturity the larva grows still more spiny. It lives in the fully developed warble, feeding on the products of the inflammation which it causes and breathing through the hole in the skin. This period of life in the tumour lasts into the ensuing summer. The larva is then some 25 millimetres long, bluntly oval in form, with a warty appearance. Its skin has become thick, and a powerful coat of subcutaneous muscles has been developed. The prickles are larger and more numerous than in the previous stages. They are probably erected by the muscles and used to create irritation and a copious secretion of the pus on which the parasite feeds. During the period of rapid growth it is desirable that the parasite should have access to the external atmosphere and should enjoy a sufficient supply of oxygen. The larva therefore enlarges the hole through the hide and lies with the tail end, containing the spiracles, in the passage, and the head end, hanging downwards, in the cavity of the warble.

When the larva has become full-fed and reaches maturity, it works a way out through the aperture of the warble. In this the prickles on its skin assist, by preventing it from slipping backwards. This exit usually takes place at night, or at least between six in the evening and eight in the morning, a habit that was long ago known to Reaumur. By fixing little bags over the apertures of the warbles it has been ascertained that the larvæ never emerge during the middle of the day. The larva pupates on the ground, taking shelter beneath a stone or clod of earth. The pupa, which is formed in the old larval skin, is dark brown and rather flattened on one side. In about twenty-five days the perfect insect emerges by forcing open the lid at the front end of the puparium.

This account of the Indian Œstrids concludes the group of Cyclorhaphous flies. The next group brings us to the Diptera Pupipara which are imaginal parasites.

(To be continued.)

The reticulation in the apices of both right wings is aberrant and the right hind stigma is double the length of any of the others. The basal saffronation is deeper and more extensive ; in the right hindwing there is an aberrant cubital nervure situated close up to the trigone in the angle ; nodal index $\frac{7\text{–}12\text{—}12\text{–}7}{6\text{–}9\text{—}11\text{–}5}$; neuration otherwise as in the male.

Head similar to that of the male, but the labrum broadly bordered with black and the metallic of upper frons encroaching on the epistome.

Prothorax yellow with a black band in front ; posterior lobe small and depressed.

Thorax golden yellow changing to golden brown on the dorsum where there is a diffuse, humeral fascia only visible below ; a small, black streak on the upper part of the postero-lateral suture.

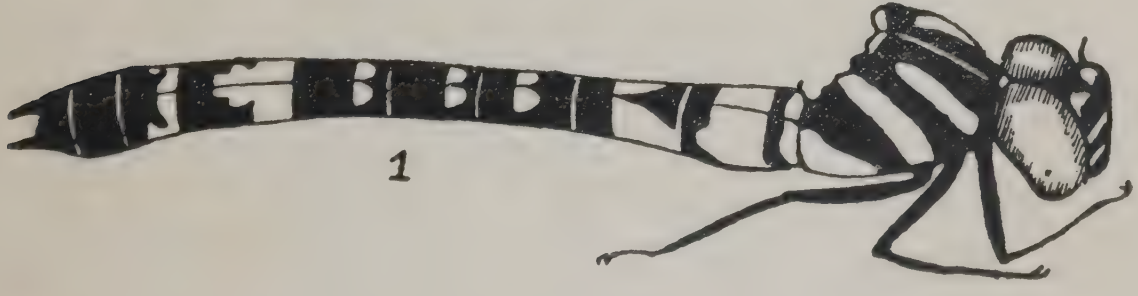
Legs rather long, slim and blackish brown in colour.

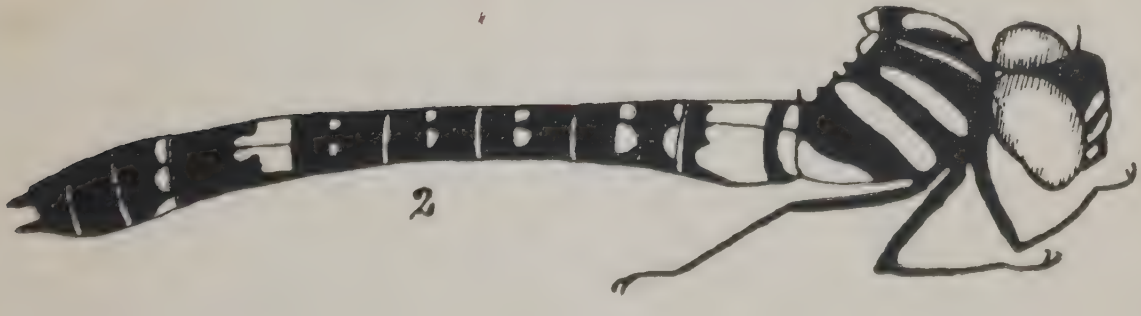
Abdomen blackish brown, segments 2, 3 and 4 having broad, light golden yellow, basal, annules, occupying 1-4th, 1-3rd and 1-7th respectively of the basal end of the segments, segments 5 to 7 with a small, basal, subdorsal spot of golden yellow, the rest immaculate.

Genital valves very similar to those of *A. curvistyl* , but the vulvar scale corrugated transversely.

The male is easily distinguished from other forms by its uniform black colour, except *A. vacillans* which in the adult stage is also matt black with abdominal segments 2 and 3 pruinosed white. (Mr. O'Donel informs me that this white mark is very conspicuous and it evidently serves the purpose of a distinguishing sexual mark.) From *vacillans, nigricolor* may be distinguished by the abdomen and hindwing being of the same length in both the sexes and also by its smaller size.

They apparently rest high as Mr. O'Donel informs me that he took the present pair by a swish of his topee whilst riding on the back of an elephant.





1. Semi-lateral view of *Macromia cingulata.*
2. Do. do. of *Macromia flavocolorata.*

6. Macromia flavocolorata, sp. nov.

A single female from Hasimara, Duars, Bengal, collected by Mr. H. V. O'Donel.

Abdomen 43 mm. Hindwing 38 mm.

Although the male of this insect has not yet been found, the markings of the female are so striking and different from other species of the genus that I have no hesitation in regarding it as new.

It resembles *M. cingulata* by its brilliant clearly defined markings and is evidently allied to that species which has hitherto stood alone in a monotypic group, but there is no possibility of confusing the two.

The facial and abdominal markings differ widely from *cingulata* and the new species is a much larger insect.

Head. Labium with the lateral lobes brown, the base narrowly yellow, midlobe yellow, its border and a medial prolongation backwards brown; labrum shiny black with a transverse, bright citron yellow spot at its base; frons and face metallic bluish green with a broad,citron yellow spot traversing the epistome; vesicle and occiput black; eyes bluish green.

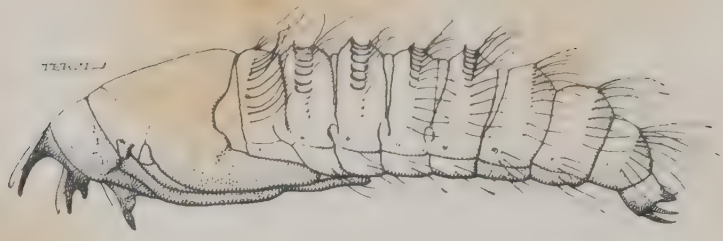
Prothorax small, yellowish.

Thorax metallic greenish blue marked with citron yellow as follows:—The antealar sinus and middorsal carina finely moderately broad, antehumeral stripes not quite reaching the alar sinus; laterally a broad, medial stripe and the posterior third of the metepimeron. Beneath white marked with 3 black, triangular spots arranged in a *fleur-de-lys*.

Abdomen tumid at the base, somewhat compressed, dilating again from the 7th segment, glossy jet black marked with clear, well-defined citron yellow marks as follows:—1st segment wholly citron yellow save for a narrow, dark, apical annule; 2nd segment similar but the annule rather broader, narrowing laterally and then sending a prolongation forwards beneath, on the dorsum the yellow invading it slightly; 3rd segment with a basal, subdorsal, linear spot and a medial, smaller, subquadrate, dorsal spot finely separated from its fellow by the black, dorsal crest. These medial spots repeated on segments 4, 5 and 6, but growing progressively smaller. On segment 7 the dorsal spots coalesce to form a very large, quadrate basal, spot occupying nearly half the segment and throwing a small projection analwards on either side of the dorsal crest. Segment 8 has a small, round, subdorsal, basal spot and a quadrate spot low down on the side at the basal end; 9 and 10 are unmarked.

Wings very patchily enfumed, with some slight evidences of dark saffronation at the extreme base; stigma small, black; 5 cubital nervures in the forewing, 4 in the hind; hypertrigones traversed 2-3 times in the forewing, twice in the hind; nodal index:— $\frac{9\text{-}15\text{—}15\text{-}6}{9\text{-}9\text{—}10\text{-}10}$

The clearly defined yellow markings will serve to separate this insect from all other Indian species whilst the more restricted and irregular abdominal markings will distinguish it from *cingulata*.



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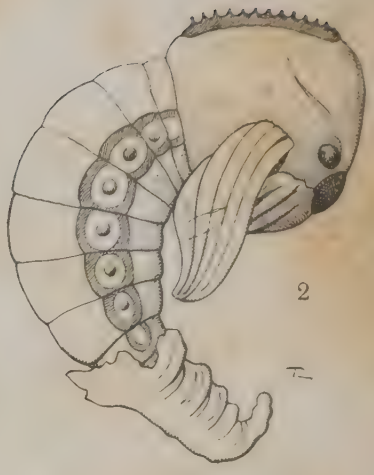

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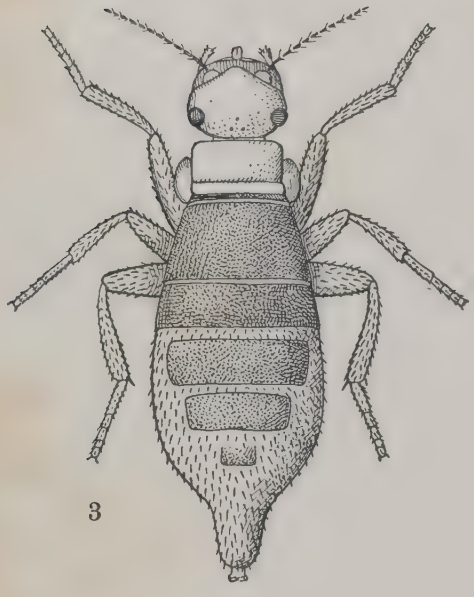

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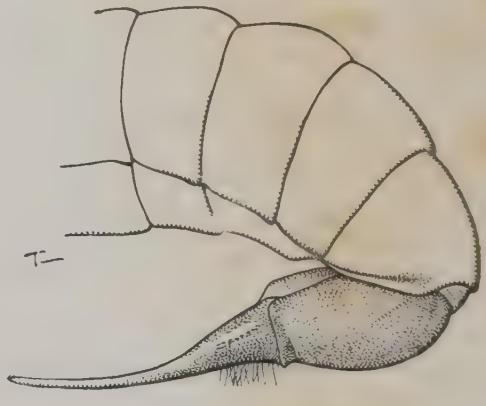

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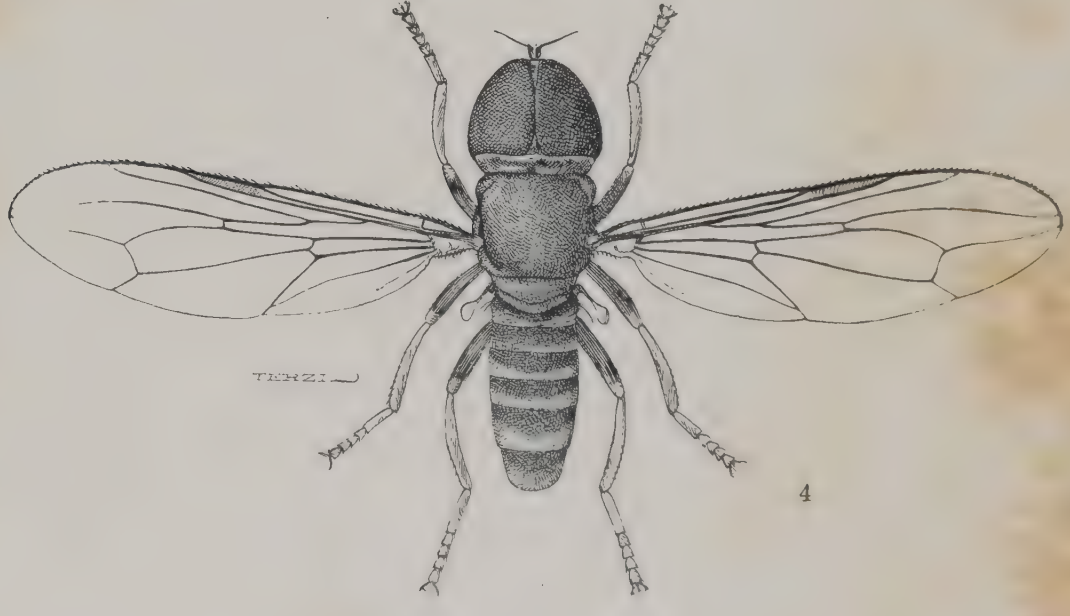

4

INDIAN PARASITIC FLIES.

1.—Pupa of *Bombylius major*, L. x 4.

2.—A Cyrtid pupa (after Brauer).

3.—Wingless Phorid, *Puliciphora* sp. (after Brues). x 38.

4.—*Pipunculus* sp. (Assam-Bhutan frontier). x 10.

4A.—Abdomen of *Pipunculus extensus*, Brunetti ♀. (Occurs in Bengal.) x 23.

RECORDS AND DESCRIPTIONS OF ORTHOPTERA FROM S. W. ASIA

BY

B. P. Uvarov, F.E.S.

(*With 2 text figures.*)

Our knowledge of the Orthopteran fauna of the vast deserts of S. W. Asia (Persia, Mesopotamia, Arabia, Baluchistan, Afghanistan, N. W. India) is, so far, extremely fragmentary, this particular group of insects not being usually favoured by collectors. At the same time, each lot of Orthoptera brought home from there, however small and accidently collected it may be, gives the strongest proof of the great richness and originality of that fauna. Endeavouring to collect as full records of species, inhabiting the Asiatic deserts, and of their geographical distribution, as it is possible, I have recently worked out all the odd specimens from Arabia, Baluchistan, Afghanistan, Persia and Syria in the British and Paris Museum collections; a small collection sent by the Bombay Natural History Society, containing the specimens taken by Lt.-Col. J. E. B. Hotson in Baluchistan, Capt. G. C. Shortridge, Lt.-Col. F. P. Connor and Lt.-Col. H. D. Peile in Mesopotamia, and by Mr. Peter Paschen in Persia (the latter lot received by the Society through Colonel P. Gough) has also been identified by me and several new forms described in the present paper. The total number of specimens studied in preparing this paper scarcely exceeds two hundred and the proportion of new species and even genera is simply astonishing. I hope that this fact will encourage all entomologists, who have the opportunity of collecting in those countries to pay more attention to a class of insects usually ignored and regarded as "uninteresting" *viz.*:—Grasshoppers, Katydids, Crickets and other members of the order Orthoptera; the writer will be very pleased to examine and work out all collections of Orthoptera from the Desert regions in Asia, however small and casually made they may be.* The types of new forms, described in this paper, are in the British Museum.

Mantidæ.

1. Eremiaphila lævifrons, sp. n.

♀: Head as broad, as pronotum; facial clypeus distinctly convex, without any trace of upper carina, smooth, sparsely impresso-punctate; ocellar area scarcely concave; transverse furrow delimitating this area from vertex feebly developed; vertex smooth, with lateral furrows distinct, but shallow, while the intermediate furrows are scarcely developed. Pronotum as broad anteriorly as it is long; distinctly narrowed posteriorly; fore margin convex in the middle, bisinuate laterally; lateral margins distinctly convex; hind margin convex; fore and hind angles a little more than 90°, acute; upper surface smooth with a transverse oval gibbosity at the fore margin and two smaller gibbosities posteriorly. Elytra distinctly coriaceous, with raised veins, longer than broad widely rounded anteriorly and at the apex, with hind margin almost straight, slightly excavate beyond the middle. Wings broader than long, with hind angle acute, rounded apically. Fore femora and tibiæ armed with four spines outwardly.

General colouration clay yellow. Head and underside whitish. Elytra beneath with a subapical oblique transverse blue-black band, not reaching the fore margin, and with a not sharply defined dark border; both the band and the

* Collections may be sent directly to the auther (British Museum [Natural History] Cromwell Road, London, S.W.7.) or through the Bombay Natural History Society. If any particulars as to the best methods of collecting and preservation are wanted the author will be glad to answer enquiries.

dark border are well visible on the upside of elytra, as well. Wings unicolorous brownish, with lighter border. Legs whitish beneath and clay-grey, with scarcely perceptible transverse bands on the upper side.

	♀ (type).	♂ (paratype).
Length of body	32,5 mm.	23,5 mm.
Length of pronotum	6, 5	5
Width of „ anteriorly	6, 5	5, 5
„ „ posteriorly	5	4
Length of elytra	13, 5	11
Width of elytra	8	7
Length of fore femora	7	6, 5
„ „ tibiæ	4	3, 5
„ „ hind femora	14	13

One female and two males, taken at Muscat, Arabia, by the late Lt.-Col. A. S. G. Jayakar (British Museum).

There is only one more known species of this genus, in which the spot on the elytra is visible from above ; this is the *E. persica* Wern., which is easily distinguished from the new species by the form of pronotal angles and by the structure of the head, as well as by the far smaller dimensions.

2. Tarachodes arabicus, n. sp.

♂. Rather small for the genus. Antennæ about twice as long as head and pronotum together. Head broader than pronotum ; facial clypeus transverse, entirely flat, its angles rounded, upper carina feeble and not reaching the sides ; occiput with two furrows nearest to the eyes rather well developed, while the two intermediate ones are scarcely perceptible. Pronotum about twice as long as it is broad in its widest part which is before its middle, but distinctly behind the transverse sulcus ; sides of pronotum parallel, with a feeble excavation before the dilated part and slightly convergent behind it ; marginal expansion narrow in prozona and rather broad in metazona, narrowing gradually towards the base of pronotum ; transverse sulcus placed near the base of the apical third, its middle part is very feebly developed, while the lateral parts are deeply impressed and strongly curved forwards, with extreme ends almost parallel to pronotal margins ; metazona with an oval gibbosity in its fore part ; middle sulcus scarcely perceptible, very shallow near the apex and base of prozona, as well as on the fore part of metazona, being entirely undeveloped on the whole basal half of the latter. Elytra longer than the abdomen, subparallel, with apex lanceolate. Wings distinctly shorter than elytra, with apical lobe markedly separated from the rest by an emargination.

General coloration pale greyish. Facial clypeus with a transverse band, upper and lower margins black. Inner side of fore legs rufous, without any black marks. Prosternum with a black transverse band near its base and brownish near the base of fore legs. Elytra entirely hyalinous, veins greyish, with only a few small brownish stripes along veins. Wings hyalinous, with cells of the hind part very feebly infumated.

	♂ (type).	♀ (paratype).
Length of body	32 mm.	34 mm.
Width of head	5	? (mutilated).
Length of pronotum	7, 5	9
„ metazona	5	6
Width of pronotal dilatation	3, 5	4
Length of fore coxæ	5	6
„ „ femora	6	6, 5
„ „ tibiæ	4	5
„ elytra	26	7, 5

	♀ (type.)	♂ (paratype.)
Length of wings	.. 23	?
,, hind femora	.. 7, 5	7, 5
,, hind tibiæ	.. 7	7

The paratypic female differs from male by the broader pronotum, armed with two tubercules, with margins strongly denticulate; by short elytra and by darker general coloration, with well pronounced grey bands on the legs; inner spines of the fore tibiæ are in female entirely black.

Two males and one female in British Museum from Ktubu, Arabia, G. W. Bury.

This species is easily distinguished from all previously known by the coloration of the inside of fore legs and prosternum; these characters seem to be very constant and quite suitable for separating species in this genus.

The new species is the first Asiatic representative of the genus *Tarachodes*, all others being known from Africa.

3. STATILIA OCELLATA, sp. n.

♀: Closely resembles *St. haani*, Sauss., but differs distinctly by the following characters: pronotum with more elongate prozona; pronotal dilatation narrower; prosternum with two whitish ocellar spots, encircled by black; fore coxæ armed with seven spines; elytra extending well beyond apex of abdomen.

Length of body	50 mm.
,, pronotum	18
,, metazona	13, 5
Maximal width of pronotum	4
Length of fore coxæ	12
,, ,, femora	15
,, ,, tibiæ	4, 5
,, hind femora	17.
,, ,, tibiæ	15, 5
,, elytra	39

One female in British Museum from Quetta, Baluchistan (received in 1889 from the Karachi Museum).

4. FISCHERIA INERMIS, sp. n.

♂: Smaller and more slender than any known species. Antennæ very long, setaceous. Head less than twice as broad as pronotal dilatation; facial clypeus transverse, with apex rotundate; occiput convex with two lateral furrows more deeply impressed than two intermediate ones, which are quite shallow; eyes thick, hemispherical. Pronotum slender; its sides slightly expanded, with a few marginal granules in prozona, but without spines and parallel in prozona and in the middle part of metazona, slightly diverging backwards; fore margin elliptical; coxal dilatation placed just behind transverse sulcus; its width is about one-half as much again as the width of pronotum in its narrowest part, which is about the middle of metazona; metazona twice as long, as prozona; median carina placed in a shallow longitudinal sulcus, very feeble in prozona, scarcely perceptible in the fore third of metazona and entirely disappearing in the hind part of the latter. Elytra extending beyond the apex of abdomen. Wings but a little shorter than elytra. Fore coxæ a little longer than metazona of pronotum, not granulated, armed with 6-7 feeble erected spines along the upper carina; fore femora smooth, their armature, as well as that of fore tibiæ presenting no difference from other species of the genus. Hind metatarsus armed with but scarcely perceptible spinules, closely lying down to metatarsus. Supra anal plate a little longer than its base wide, acutely triangular, with apex rounded, lateral margins feebly but distinctly concave, median keel developed in the middle part only. Cerci rounded, rather thick, distinctly longer than supra anal plate. Subgenital plate with its apex triangularly emarginated between short styli.

General coloration grey. Fore coxæ unicolorous, fore femora with three darker coloured bands on the upper side. Pronotum unicolorous, darker than elytra. Elytra with a whitish border along the fore margin of the costal area, interrupted by irregular brownish spots; bases of radial veins pale; a somewhat darker not sharply defined transverse spot in the basal third, followed by a whitish area; the second, larger and more defined whitish spot before the apex, followed by a smaller dark spot; veins darker than cellules, and the whole surface appears, therefore, slightly marmorated; anal area brownish-violaceous, but not so dark as in other species, the colour fading backwards. Wings rather equally infumate throughout the whole surface, the basal part being scarcely more hyaline; transverse venules pale; apex with a common, for this genus white spot, encircled by brownish-violaceous colour.

Length of body	40 mm.
Width of head	5
Length of pronotum	9,5
„ metazona	6,5
Maximal width of pronotum	3,25
Minimal „ „ „	2
Length of fore coxæ	7
„ „ „ femora	9
„ „ „ elytra	30
„ „ „ wings	27
„ „ „ hind femora	13
„ „ „ „ tibiæ	14
„ „ „ „ metatarsi	4,5

The type is unique; it has been taken by G. W. Bury at El-Kubar, S. W. Arabia (British Museum collection).

This new species is easily recognised by its small size, very feebly armed hind metatarsus, not denticulated pronotum and the shape of supraanal plate.

5. Fischeria syriaca, Sauss.

1871. *Fischeria bœtica*, Ramb. var. *syriaca*, Saussure, Mém. Soc. Phys. Genève, xxi, p. 109.

1915. *Fischeria festæ*, Giglio-Tos., Bull. Soc. Entom. Ital., xlvii, p. 22.

Giglio-Tos, in description of his *F. festæ* gives exactly the same differences of it from *F. bœtica*, as Saussure gives for var. *syriaca*; both being of the same origin, it is obvious that they are identical. The same species (or only subspecies of *bœtica*, Ramb.), and not the typical *bœtica*, Ramb., populates all desert parts of S.W. and Central Asia, and all previous records of *bœtica* from those countries must be undoubtedly credited to *syriaca*.

Male of *syriaca*, of which only female has been described by Saussure and Giglio-Tos, differs well from *bœtica* by its larger dimensions, and especially by longer elytra which extend well beyond the apex of abdomen; wings are scarcely shorter than elytra. Dimensions of a male from Mesopotamia are, as follows :—

Length of body	72mm.
Width of head	7, 5
Length of pronotum	18
„ metazona	12
Maximal width of pronotum	5, 5
Minimal „ „	3
Length of fore coxæ	13
„ „ femora	17, 5
„ hind „	21
„ „ „ tibiæ	25
„ „ „ metatarsus	6, 5
„ elytra	48

The specimens studied are from the following localities: Kut and Amara in Mesopotamia; Bushire in S. W. Persia; Aleppo, Syria (in British Museum and in Bombay N. H. Society).

6. MICROTHESPIS DMITRIEVI, Wern.

One male in British Museum from Bushire, S. W. Persia. The species has been described (Ann. Mus. Zool. Petersb., xiii, 1908, p. 120) from Djibouti and Harrar on the Somali Coast.

7. IRIS PERSA, sp. n.

♂. Agrees in all essential characters with *I. oratoria*, L., but differs well from it in the shape of head, pronotum and elytra.

Larger than *I. oratoria* and more robust. Head transverse, a little less than twice as broad as pronotal dilatation; facial clypeus about one and half times as broad as high, with upper keel not sharp, slightly curved, developed in the middle only and disappearing towards the eyes, with short vertical median carina, extending from upper margin to the middle of clypeus, where there are two raised points; other four raised points are at the angles of clypeus. Occiput distinctly convex. Pronotum rather thick; prozona slightly narrowed anteriorly, with parabolic apex, with feeble median longitudinal furrow; metazona about twice as long as prozona, gradually narrowed posteriorly in its fore half, while in the hind half its sides are parallel; margins of pronotum expanded. Elytra extending but a little beyond the apex of abdomen, about three times as long as they are in the broadest part wide; preradial area widened in its basal third and rather suddenly narrowed towards the apex; the venation agrees with this in *I. oratoria*. Wings distinctly shorter than elytra, with apex parabolic; hind margin almost straight. The armure of fore legs much the same as in *I. oratoria*, but the coxæ are more strongly spined and granulated. Supraanal plate rounded; cerci rounded, rather thick. Subgenital plate with hind margin rather broad, slightly convex.

Greenish-pale; fore tibiæ with inner surface reddish; fore metatarsus black beneath. Coloration of wings as in *I. oratoria*.

Length of body	41 mm.
Width of head	6,5
Length of pronotum	13,5
„ metazona	9
Maximal width of pronotum	4,5
Minimal „ „	3
Length of elytra	29
Maximal width of elytra	8,5
Length of wings	24,5
„ „ fore coxæ	9
„ „ femora	11,5
„ „ „ tibiæ	6
„ „ hind femora	11
„ „ „ tibiæ	10,5

Four male specimens in the British Museum from Bushire, S. W. Persia taken in September 1890, by W. D. Cumming.

The most striking differences from *I. oratoria* are: the form of clypeus, which in *oratoria* is more than twice as broad as high, with well developed upper carina; the form of pronotum and especially the relative length of prozona and metazona; the length and form of elytra. Co-typic specimens are of brick-reddish general coloration, but I am not sure that this coloration is natural and not the consequence of immersion in spirit.

8. IRIS SPLENDIDA, sp. n.

♀. About the size of *I. oratoria*, L., but more robust. Antennæ thin, setaceous. Frontal clypeus about twice as broad, as high, flat, with two small

tubercules in its middle, its upper carina not sharp, but fully developed, rounded ; vertex with two lateral furrows narrow, but very distinct. Eyes egg-shaped ; inner orbits slightly emarginate in upper part. Pronotum rather broad ; its margins denticulate ; fore margin semicircular ; sides in prozona and in metazona parallel ; coxæ dilatation but a little wider than prozona, while metazona is distinctly more narrow ; prozonal disc very convex, with two small oblique impressions near its apex ; its longitudinal sulcus scarcely perceptible in the hind part only ; transverse sulcus not interrupted, narrow, but very distinct, straight, with ends directed forwards ; metazona twice as long as prozona. less convex, slightly selliform in profile, with two shallow impressions just behind the coxæ dilatation, with middle carina entire, though feeble, better developed in the hind part ; the whole surface of pronotum, especially the middle part of metazona, bears scattered small granules ; hind margin widely rounded, with slight, but sharp, emargination in its middle. Elytra shorter than abdomen, entirely coriaceous, slightly widened towards the apex, which is very widely rounded. Wings semicircular. Anterior coxæ with numerous densely placed acute tubercles beneath ; interior surface with an irregular row of callous tubercles ; upper external carina armed with eight obtuse spines, with minute acute spinules, placed in interspaces ; upper surface slightly convex, smooth, with a few scarcely perceptible spinules, placed in a longitudinal row along the middle. Fore femora and tibiæ with an armure typical for the genus. Supraanal plate semi-elliptical, feebly carinated along its middle. Cerci short, thick, rounded. Subgenital plate with apex divided in two lobes.

General coloration greyish-yellow. Spines of fore femora and tibiæ brownish, darker towards the tips. Fore tibiæ orange red beneath. Fore metatarsi black on the inside, except the apices. Wings violaceous-black ; humeral field rose-violaceous, with an oval black spot near the apex ; the whole outer margin with a bright sulphurous border about 2-3mm. broad.

Length of body	48 mm.
Width of head	6
Length of pronotum	12,5
„ metazona	8,5
Width of prozona in its middle	4
„ metazona „ „	3,5
„ „ coxal dilatation	5
Length of elytra	17
Width of elytra in their middle	7
Length of wings	15
Width „ in their middle..	12
Length of anterior coxæ	9
„ „ femora	11
„ „ tibiæ	5,5
„ hind femora	10

The type is unique. It was brought home from Afghanistan by Dr. Aitchison of the Afghan Delimitation Commission, but somehow, probably because it had not been set out, it remained unnoticed and was not recorded by W. Kirby, who worked out the collection of the said Commission.* The species is so conspicuous by the splendid coloration of its hind wings, that there is no need for its comparison with other known species of the genus.

9. HESTIASULA BRUNNERIANA, Sauss.

Quetta, Baluchistan, 1 ♀ (British Museum).

The single poorly preserved specimen agrees fairly well with Saussure's original description, as well as with Wood-Mason's drawings (Journ. Asiat. Soc., Bengal

* Trans. Linn. Soc., London, second series, Vol. V, part 3, pp. 137-14 .

1884, Vol. liii, pl. xiii, fig. la, 1b.) which according to the author (Revis. Mantid., 1889, p. 22) presents the same species. The drawing of the head is, however, not quite exact, since it presents the lower surface of frontal appendix as convex, while it is entirely flat, as rightly described by Saussure. This species has been known from Sylhet, Calcutta and Mysore; Quetta is, therefore, the most north-western known point of its distribution.

10. BLEPHAROPSIS MENDICA NUDA, Giglio-Tos.

1917. *Blepharopsis nuda*, Giglio-Tos, Bull. Soc. Ent. Ital., xlviii, p. 70 (of separate copy.)

Numerous specimens in British Museum from Arabia, Sinai, Mesopotamia, Quetta, etc.

The characters of *nuda* are not quite constant; especially variable and not characteristic for *nuda* is the degree of hairiness of the pronotum, on which Giglio-Tos has based his species. On the other hand the form of femoral lobes, specially those of middle femora, is rather constant: while in typical *mendica* (from Portugal, Canaries) these lobes are scarcely denticulate at all, the specimens from Desert Asia have the lobes strongly spined. As this character is, however, also liable to individual variation, I think it more right to regard *nuda* as but an Eastern geographical race of *mendica*.

Phasmidæ.

11. BURRIA LONGIXIPHA, Br. Watt.

Aden, Arabia, 1 ♀ (British Museum).

The genus and this species has been hitherto known from the African Coast of the Red Sea.

Locustidæ.

12. ACRIDIUM SUBULATUM, L.—Baghdad, ii. 17 (Bombay N. H. Society).

13. ACRIDELLA ROBUSTA, Uvar.—Persia: Pusht-i-koh, Chekerava, 540 m. above sea-level, 1907, de Morgan (Paris Museum).

14. ACRIDELLA MINIATA, Kl.—Amara, Mesopotamia, viii-ix. 16., Lt.-Col. F. P. Connor (Bombay N. H. Society).

15. ACRIDELLA ANTENNATA, Krauss.

One male and two females were taken at Ktubu, Arabia, by G. W. Bury.

The species is easily recognised by its very long antennæ and strongly attenuate hind angle of pronotum, apart from the peculiar dark coloration of wings.

16. PLATYPTERNA TIBIALIS, Fieb.—Arabia, Percival and Dodson, 2 ♂♂, 2 ♀♀, (British Museum).

17. PLATYPTERNA PICTIPES, sp. n.

♀. Of medium size for the genus. Antennæ rather short (their exact length unknown, the tips being broken), moderately compressed and widened in basal part.

Front moderately reclinate, smooth, but not shining; frontal ridge parallel, slightly dilated near the ocellum, gradually and very feebly widened towards the clypeus; fastigium of vertex seen in profile subequal to one-half of the length of an eye; foveolæ reniform, rather broad, curvate, not strongly impressed, with margins rounded, the upper margins being especially obtuse and low, while the lower ones are better developed; vertex seen from above obtuse, rotundato-triangular at the apex, as broad, as long, convex, with thick, but very low, shining median carina. Eyes oval, oblique. Pronotum feebly, but distinctly constricted in prozona; lateral keels parallel between the fore margin and the second transverse sulcus, gradually diverging behind the latter, slightly convex in about the middle of metazona; median keel sharp, straight, interrupted by the third sulcus; metazona distinctly shorter than prozona, distinctly convex and raised above the level of prozona; hind margin obtusely angulate, with the angle itself not rounded; lateral lobes rather convex, narrowed downwards, with fore margin slightly sinuate, lower margin feebly bisinuate, with a very

minute obtuse angle in the middle, hind margin straight, feebly sinuate; fore and hind angles of lobes a little more than 90°, rounded. Elytra very long, parallel-sided. Hind femora moderately broad, rather robust, subapical filiform part not developed.

General coloration is that of sand. Head with small brownish spots, forming two occipital and two postocular stripes. Pronotum with lateral keels shining, paler than disc; lateral lobes darker along their upper margin and with a narrow whitish border beneath. Elytra sand-coloured in the basal fifth part and colourless in the rest, with a longitudinal row of brownish spots in the intercalate area and 3-4 smaller and more feebly coloured spots in the apical third, just behind the second radial vein; several feebly coloured spots are also scattered on the whole apical half of elytra; all veins and venules are sand-coloured with small irregular darker knots. Wings hyalinous; veins, especially near the apex, brownish. Hind femora with superno-median area of the general coloration, while the externomedian area is whitish; inner surface unicolorous; inner genicular lobe with a round dark-brown spot. Hind tibiæ violaceous, their upper surface paler, especially towards the base; spines pale basally, with brown tips.

Length of body	.. ..	33, 5 mm.
„ pronotum	.. ..	6
„ elytra	.. ..	30, 5
„ hind femur	.. .. ..	15, 5

Type: Muscat, Arabia, G. Jayakar.

This species seems to be related to *P. geniculata*, Bol. (Novit. Zool., *XX*, 1917, p. 608, No. 9) from Algerian Sahara, but it is well characterised by the structure of frontal ridge, foveolæ of vertex, shape of pronotum and coloration of hind tibiæ.

18. Dociostaurus crassiusculus, Pant. (=*hauensteini* Bol.).—Persia: Poush-e-kouh, Arkovaz, J. de Morgan, 1904 (Paris Museum).

19. Dociostaurus maroccanus, Thunb.—Persia: Abadeh, Peter Paschen (Bombay N. H. Society).

20. Ramburiella truchmana, F. W.—Syria, Aleppo, F. G. Aldous (British Museum).—The genera *Ramburiella*, Bol. and *Pallasiella*, Kirby, are evidently identical, since *Ramburiella hispanica*, Ramb. and *Pallasiella truchmana*, F. W., are undoubtedly congeneric. As Bolivar's name for the genus is the oldest of the two, the genus must be called *Ramburiella*, and it includes three species: *R. hispanica*, Ramb., *R. truchmana*, F. W. and *R. bolivari*, Kuthy.*

21. Æolopus thalassinus, Rossi.—Baghdad, ii., 17 (Bombay N. H. Society).

22. Æolopus strepens strepens, Latr.—Syria, Aleppo, F. G. Aldous; Baghdad (British Museum); Persia: Susa, J. de Morgan (Paris Museum).—This Mediterranean species has never been previously recorded from the Desert subregion and its occurrence in Baghdad and Susa in the typical form is quite interesting, since in S. W. Persia another race occurs, which is described below.

23. Æolopus strepens desertícola, subsp. n.

Differs from the typical Mediterranean form in the following characters:—

Pronotum more distinctly constricted, less convex above; elytra somewhat longer; general coloration brownish-grey; elytra with wider light transverse bands; wings feebly infumate apically; hind femora with black points along the lower carina of the area externomedia and with three indistinct fasciæ in the same area; inner side of femora pale with two black fasciæ; hind tibiæ bluish with black base, and a pale subbasal ring, followed by a dark grey ring.

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* Described as *Stethophyma bolivari* Kuthy (Ann. Mus. Hung., 1907, p. 431), and again by me as *Arcyptera elegans*, Uvar. (Horæ Soc. Entom. Rossicæ, Vol. 39, 1910, p. 370; see also Bull. Mus. Caucase, xii, 1919, p. 156); this species is very closely related to *R. hispanica*, Ramb. and is possibly but a geographical race of the latter

		♀
Length of body	.. ..	20 mm.
„ pronotum	.. ..	4
„ elytra	.. ..	19, 5
„ hind femur.	.. ..	12

Described from one male specimen, taken at Kazvin, N. W. Persia, 25, viii. 19, by P. A. Buxton.*

24. LERINA ÆOLOPOIDES, sp. n.

♂. Of the size of *L. œdipodioides*, Bol., but more compressed laterally. Antennæ very feebly flattened and scarcely dilated apically. Head in profile distinctly reclinate; frontal ridge gradually, though feebly, widened towards clypeus, shallowly, but distinctly, impressed, with margins raised, rather sharp; facial keels raised, almost straight. Fastigium of vertex distinctly longer than broad, pentagonal, with apex much attenuate, acute; lateral margins raised, sharp, the anterior ones feebly concave; surface very feebly sloping forwards, slightly concave. Temporal foveolæ elongate, strongly narrowed anteriorly, triangular, feebly curvate, shallow, with raised margins. Eyes slightly higher than broad, less rounded anteriorly than posteriorly. Occiput with its surface uneven. Pronotum distinctly constricted laterally, much alike in its shape to that of *Æolopus strepens*. Latr.; disc subtectiform, feebly narrowed anteriorly; median keel raised, slightly lowered behind the first transverse sulcus, interrupted by the hind sulcus, which is placed distinctly before its middle; metazona with its hind angle acute; lateral keels scarcely perceptible in the fore part of prozona, very obtuse in metazona; lateral lobes higher than long, with their lower margins oblique in the fore part; their fore angle obtuse, hind angle straight, widely rounded. Elytra with the fore ulnar vein sinuate; false vein in discoidal area thick, distinctly transversely serrulate, approaching apically to the hind radial vein; interulnar area more than twice as broad as the discoidal area, with the false vein distinct only near the base of the area, the rest of the latter being irregularly reticulated; furcal branches of the ulnar vein, as well as the false vein in the interfurcal area and transverse venules in the same area, are distinctly thickened, callous.

General coloration reddish-sandy with black and grey points and designs. Antennæ unicolorous. Face whitish; frontal and facial keels with black longitudinal spots. Pronotum with numerous blackish points. Elytra with three broad castaneous fasciæ: sub-basal, median and pre-apical, all reaching the anal area, but not extending into it; interspaces between the fasciæ whitish; apex hyaline; anal area sandy. Wings feebly greenish basally, with an indefinite infumate preapical fascia, not reaching the inner margin. Hind femora outwardly reddish-sandy in the basal half and blackish apically, with a reddish ring before the knee; innerside and lower sulcus totally black, except a pale preapical ring; knees blackish, except the reddish upside. Hind tibiæ black, with apex and a narrow subbasal ring ivory white. Hind tarsi ivory white, with second joint brownish. Abdomen reddish with 3-6 segments black laterally.

Length of body	.. .. 16, 5 mm.
„ pronotum	 4
„ elytra	 18
„ hind femur	.. .. 9, 5

The unique specimen of this species has been taken by A. S. G. Jayakar at Muscat, Arabia (British Museum). It is with some hesitation that I put this species into the genus *Lerina*, Bol. which has been described from one Indian

* Specimens of this race recorded by me (Journ., Bombay N. H. Soc., Vol. xxvii, 1921, p. 804) from Mesopotamia, seem to belong to a distinct species, which I am unable to identify with certainty now, owing to scarcity of material.

species—*L. œdipodioides*, Bol. The new species itself is very striking by its close resemblance to *Æolopus strepens*, Latr., by venation of elytra and by coloration of the same and of hind legs.

25. LERINA BUXTONI, sp. n.

♂, Of the size and habitus of the Indian *L. œdipodioides*, Bol. Antennæ slightly flattened, feebly dilated towards the apex; last joint truncate. Front in profile distinctly reclinate; face impresso-punctate; frontal ridge subparallel, rather suddenly narrowed near fastigium and very feebly widening towards clypeus, not reaching the latter, flat, with a small impression below the ocellum, with lateral margins obtuse; facial carinæ obtuse, rather thick, feebly curvate, Vertex slightly sloping; fastigium much longer than broad, elongato-hexagonal, narrowly truncate anteriorly, slightly concave, with raised margins; foveolæ long and straight, strongly narrowed anteriorly, almost triangular, shallow, with margins not sharply delineate. Eyes almost vertical, distinctly higher than broad, with fore margin straight. Pronotum feebly constricted and rounded in prozona, which is distinctly longer than metazona; median keel in prozona scarcely distinct, interrupted by two transverse sulci, in metazona sharp, though low; lateral keels in the shape of small, low tubercules near the fore margin of prozona and very obtuse in metazona; fore margin of the pronotal disc slightly prominent, with a small emargination in the middle; hind margin obtusely angulate, widely rounded; lateral lobes much higher than long, with lower margin oblique in its fore part, fore angle obtuse, hind angle about 90° rounded. Elytra extending beyond the hind knees; interulnar field about twice as broad as discoidal, with an irregular false vein; intercalate vein in discoidal area approaching apically to the radial vein; two furcal veins and the false vein in the furcal area, as well as transverse venules in the same area thick, callous. Venation of wings as in *L. œdipodioides*, Bol. Hind femora short, broad; hind tibiæ shorter than femora.

General coloration is that of sand, with numerous greyish and blackish points. Antennæ brown with numerous pale rings. Pronotum above brick-reddish, with two indefinite blackish longitudinal sinuate fasciæ. Elytra with three irregular blackish bands and scattered brownish-grey spots. Wings hyalinous, very feebly coerulescent basally. Fore and middle legs with several brown transverse fasciæ. Hind femora with two irregular transverse fasciæ in area externomedia and with three on the upper side; inside black, except a post-median and a preapical pale fascia; knees black from inside and grey outwardly. Hind tibiæ ivory white, with base, median and preapical rings, and tips of spines, black.

Length of	body	19, 5 mm.
,,	pronotum	3, 5
,,	elytra	19
,,	hind femur	9, 5

The unique type specimen has been taken by P. A. Buxton at Amara, Mesopotamia, 10. viii, 18, together with a paratypic male, which agrees with the type in all morphological characters, but has the elytra unicolorous, without any trace of fasciæ or spots.

26. (EDALEUS NIGROFASCIATUS, De Geer.—Persia: Bakhtyari Mountains, 1500-4500 m., J. deMorgan, 1904 (Paris Museum).

27. SCINTHARISTA NOTABILIS BRUNNERI, Sauss.

1884. *Scintharista brunneri*, Saussure, Prodr. Oedipod., p. 121, No. 1.

1888. *Quiroguesia brullei* var. *blanchardiana*, Saussure, Add. ad Prodr. Œdipod., p. 35.

The most careful examination of the cotypes of *blanchardiana*, Sauss., which are in British Musuem, and comparison of them with original description of *brunneri*, Sauss., leaves no doubt in the identity of this form. It is evident, therefore, that the genera *Scintharista*, Sauss., and *Quiroguesia*, Bol., are identical

and Saussure's name has priority. I consider the Asiatic *Sc. brunneri*, Sauss., as a mere geographical race of the Western Mediterranean *Sc. notabilis*, Walk. (=*brullei*, Sauss.), the difference between them being too insignificant for separation of species. This race occurs in two different colour forms, which might be taken together, one with rose wings and another with yellow wings ; it is distributed all over the deserts of S. W. Asia. from North Kashmir and Bombay to Ordubad in Transcaucasia and to Southern Arabia, occurring even at Massowah, on the African Coast of the Red Sea.

Specimens in British Museum are from following localities :—Aden, Arabia (Co-types of *blanchardiana*, Sauss). ; Muscat, Dr. Jayakar ; Malakand, N. India, A. Begbie ; Campbellpore, N. India ; Hunza, N. Kashmir ; Quetta, Baluchistan. In the Bombay Natural History Society there is one female from Teghab Kelat, Baluchistan, 28, viii, 17, J. E. B. Hotson.

28. Morphaeris fasciata, Thunbg., ab *sulcata*, Thunb.—Syria, 1 ♂ (British Museum).—Full synonymy of this species is given by me in another paper on the Indian Orthoptera. Annals and Magazine of Natural History, 1921, p. 488).

29. Mioscirtus wagneri Ev.—Fao, Persian Gulf, v., 91, W. D. Cumming, 2 ♀ ♀ —Specimens from Mesopotamia and Southern Persia are somewhat larger than those from the original locality of the species, which is Sarepta, North from Caspian Sea ; if this difference proves to be constant in large series of specimens, a distinct southern geographical race may be distinguished, which might be called subsp. *rogenhoferi*, Sauss. (described as *Conozoa rogenhoferi*, Sauss.).

30. Pyrgodera armata, F. W.—Jebel-Hamrin, River Diala, Mesopotamia, vii, 18, 1 ♂, H. D. Piele ; Bakhtyari, W. Persia, 29, vi. 11, 1 ♂, G. B. Scott (British Museum) ; Abadeh, W. Persia, P. Paschen (Bombay Society) ; Eivar-i-kerkha, Persia, iv. Vol. 1907, I. deMorgan (Paris Museum).

31. Sphingonotus savignyi, Sauss.—Abadeh, Persia, vii-viii, P. Paschen (Bombay Society).

32. Sphingonotus brunneri, Sauss.—Abadeh, Persia, vii-viii, 1 ♀, P. Paschen (Bombay Society).

33. Spingonatus balteaus, Serv.—Abadeh, Persia, vii-viii, 1 ♂, 2 ♀ ♀, P. Paschen (Bombay Society).

34. Sphingonotus octofasciatus, Serv.—Abadeh, Persia, v-vi, 2 ♂ ♂, 3 ♀ ♀, P. Paschen (Bombay Society).

35. Helioscirtus moseri, Sauss.—Benn-Chah-Bah, Baluchistan, 20. viii. 17, 1 ♀, J. E. B. Hotson (Bombay Society).

Iranella, gen. nov.

General habitus not unlike that of *Sphingonotus*, but elytra and wings only half developed.

Head rather large and thick. Front vertical ; frontal ridge above ocellum flat, broad, strongly punctured, below ocellum suddenly depressed and narrowed, with lateral margins raised, and totally disappearing half-way between ocellum and clypeus ; face broad ; facial keels strongly raised, rather thick, vertical, diverging downwards ; lateral ocelli touching the eyes and lateral margins of fastigium ; fastigium strongly sloping, slightly convex, strongly rugose, with a short median sulcus which is widened anteriorly, then narrowed again and passing gradually into frontal ridge ; vertex between the eyes slightly concave, broad, with lateral margins straight, parallel, with a low median carinula, bifurcate anteriorily, very narrowly sulcate and extended into the occiput, the latter strongly rugose. Pronotum in prozona constricted and cylindrical intersected by three deep transverse sulci, the second one being bifurcate in that disc, so that the latter is intersected by four sulci ; lateral keels in prozona distinct, but interrupted in the middle ; metazona equal in length to prozona, slightly convex, strongly rugose and densely covered with small tubercules, while tubercules in prozona are large, but not densely placed ; median carina in prozona replaced by a scarcely perceptible sulcus, while in metazona it is

well developed, very thin, linear ; hind angle of metazona straight, rounded ; lateral lobes about as long as high, strongly widened upwards, their fore margin slightly sinuate, lower margin oblique and very feebly sinuate in the fore part, hind margin very oblique, almost straight ; hind angle obtuse, rounded ; prozona in lateral lobes more than twice as long as metazona. Prosternum with its fore margin produced in a large, trapezoidal collar, widened and slightly bi-sinuate apically, with outer angles a little less than 90°. Pectus very broad ; mesosternal lobes trapezoidal, a little broader than long, with inner and hind margins straight, inner angles sharp, about 90° ; mesosternal interspace broader than long ; metasternal lobes extremely short, their interspace equal in breadth to the mesosternal one. Tympanum very large, oval. Fore and middle tibiæ armed with 2-3 small spines both on outer and inner side near the apex. Hind femora rather short, thick, with upper carina denticulate ; lower carina not widened, almost straight. Hind tibiæ slightly incurved and widened towards the apex, with 9 inner and 8 outer spines, without subapical spine on the outside ; outer spures twice as short as the inner ones. Elytra just a little longer than abdomen, coriaceous, rugose, with the fore margin gradually rounded, hind margin almost straight, apex widely rounded ; veins rather irregular, sinuate ; pre-radial area broad ; discoidal area open with an irregular intercalate vein : anterior ulnar vein straight, reaching the apex of elytra ; anal area almost equal in breadth to one half of the whole elytra. Wings shorter than elytra, circular.

Genotype : *Iranella eremiaphila*, sp. n.

36. Iranella eremiaphila, sp. n.

♂ : Greyish ochraceous, with whitish and grey marks. Elytra beneath with several confluent round black spots in the pre-radial area and four smaller and lighter coloured ones in discoidal area ; all these spots are slightly conspicuous (grey) on the upper side ; the hind radial and humeral veins, as well as all transverse venules of the anal field bluish-black on the lower side, but not distinctly coloured on the upside of elytra ; hind femora slightly rose in the basal half of the inner side, with two scarcely perceptible greyish transverse fasciæ in area extreno-media ; knees grey. Hind tibiæ bluish-grey in the basal half, slightly rose apically, with spines sanguineous, black tipped.

Length of body	.. ..	15 mm.
,, pronotum	.. ..	5, 5
,, elytra	.. ..	11
Maximal width of elytra	.. .. ..	5
Length of hind femur	.. ..	10

The type of this striking insect is unique. It has been taken by P. Paschen in Abadeh, Persia, vii-viii, 1916.

This insect somewhat resembles *Sphingonotus* in the shape of the head and pronotum, but the disc of the latter is intersected by four sulci ; short elytra and wings give it a general appearance quite unlike any other genus of *Œdipodinæ*. The black spots on the underside of elytra remind one of the Mantid genus *Eremiaphila* ; their biological meaning is quite incomprehensible without a careful study of the biology of the insect in its natural surroundings.

37. Œdipoda gratiosa, Serv.—Persia ; Abadeh, vii-viii. 16, P. Paschen (Bombay N. H. Society).

38. Acrotylus longipes, Charp.—Arabia : Muscat, 1 ♂, A. S. J. Jayakar (British Museum).

39. Acrotylus insubricus, Scop.—Persia : Abadeh, vii-viii. 16, P. Paschen (Bombay N. H. Society).

40. Tmethis cisti, F.—Syria : Aleppo, F. G. Aldous (British Museum).

41. Tmethis saussurei, Uvar., ab. violacea, n.—Differs from the typical blue-winged form only by the violaceous colour of wings, all morphological

characters, as well as dimensions, being the same. Types and several cotypes from Abadeh, Persia, P. Paschen (British Museum and Bombay N. H. Society).

42. TMETHIS HOTSONI, sp. n.

♀. Large, laterally compressed. Head narrow, prominent above pronotum; front reclinate; frontal ridge expressed above ocellum only, totally and abruptly disappearing below it; fastigium of the vertex strongly sloping, longer than broad, slightly widened anteriorly, transversely rugose; eyes very prominent, oval; occiput with an irregular median carina. Pronotum laterally compressed, especially so in prozona, which is considerably narrower and shorter than metazona; prozona strongly tectiform, with median crista thick, deeply intersected by three transverse sulci, the hindmost of which is especially deep; metazona as high, as prozona, thick, tectiform in its fore half, with thick elevated carina, which disappears on the apical third; hind angle acute, rounded; lateral lobes much higher, than long, with fore margin slightly sinuate; lower margin sinuate anteriorly; hind angle of lobes straight, rounded; whole pronotum is covered with rather large, but not dense callous tubercules; metazona rugulose. Elytra very long, extending far beyond hind knees. Hind wings a little shorter than elytra. Mesosternal lobes nearly triangular, their inner margins being strongly oblique; interspace much broader, than long. Metasternal lobes widely separated. Hind femora elongate, granulose, with upper margins slightly undulate; lower margin straight. Second abdominal segment raised posteriorly in a rather thick median protuberance.

General coloration whitish-grey; pronotum feebly brick-reddish. Elytra ochraceous-grey, with indistinct grey marks. Wings light greenish-blue, with a 4-5 mm. wide black band, which starts from the middle of fore margin and runs straight backwards to the hind margin but does not reach it by about 5 mm., suddenly turning under a straight angle inwardly and reaching the inner margin; two apical lobes brown. Hind femora coeruleous beneath, light blue inwardly, with inner knee lobes dark blue. Hind tibiæ with inner and upper surfaces blue, with a pale ring near the base and a red apical spot. Abdomen pale with hind margins of basal tergits blue-black.

Length of body	.. ..	65 mm.
,, pronotum	.. ..	14
,, elytra	.. ..	56
,, hind femur	.. ..	24

The female of this species has been taken by Lt.-Col. J. E. B. Hotson in Mand, Baluchistan, 29, iv. 1916, on sand; it bears the remark, "plentiful," but only one rather damaged specimen has been included in collection sent to British Museum by the Bombay Society. The species belongs to the group of *T. gibber*, St., but is bigger, more constricted laterally, with longer elytra, than any other known species, and is also easily recognised by narrow band of wings, bent under a right angle.

43. POECILOCERUS VITTATUS, Klug.—Arabia: Aden, Ktuba (British Museum).

43*a*. PŒCILOCERUS VITTATUS var. CALOTROPIDIS, Karsh.—A very large series of specimens in British Museum from Hadramaut, Arabia.

44. POECILOCERUS PICTUS, F.—Baluchistan: Quetta (British Museum); Ormarah, W. Cumming; Nal, 21, ix. 17 and Greshag-Kalat, 28, viii, 17, J. E. B. Hotson (Bombay N. H. Society).—These are the most north-western records of this Indian species.

44*a*. PŒCILOCERUS BUFONIS, Klug. and ab. *vulcania*, Serv.—Very numerous specimens in Paris Museum from Sinai, J. Couayt, 1908, belonging both to typical form and entirely black ab. *vulcania*, together with several of intermediate coloration.

45. POECILOCERUS ARABICUS, sp. n.

♂. Size rather small for the genus. Antennæ feebly flattened, distinctly longer than head and pronotum together. Front not very oblique, scarcely concave

in profile; frontal ridge between antennæ strongly compressed, very narrowly sulcate, the sulcus slightly widened towards ocellum, suddenly narrowed below it, gradually widened and becoming more shallow towards the clypeus, not reaching the latter; lateral facial keels more raised near the eyes, lowered below their middle. Fastigium of vertex attenuate, convex, rugosely punctate, with apex deeply furrowed. Eyes very prominent, short, oval. Occiput with a low median carina. Pronotum short, convex, its whole surface feebly coriaceous; transverse sulci very feeble; median carina undeveloped in prozona and scarcely perceptible in metazona; the latter a little shorter, than prozona; hind margin very widely rounded; lateral lobes with fore angles very obtuse, hind angles obliquely truncate. Elytra narrow, extending a little beyond hind knees, marginal field feebly widened basally and gradually narrowed towards apex, the basal dilatation being, therefore, not as well marked, as in most other species of the genus; apex of elytra elliptical. Wings shorter than elytra, with disc coloured. Hind femora slender, narrow. Supraanal plate obtusely triangular. Cerci short, slightly compressed, obtuse. Subgenital plate thick, rounded, carinated apically.

General coloration grey. Antennae with basal joints blackish, with apical two-thirds irregularly annulated with brown, black and pale rings; apical joints black. Face pale-brownish. Fastigium blackish from above. Occiput of darker shade than the cheeks. Pronotum unicolorous grey, with hind margin narrowly shining black. Mesonotum and metanotum bluish-black. Elytra ash-grey, with numerous orange-yellow speckles. Wings rose, except the apex and hind border, which are hyalinous; veins in apical part brownish. Abdomen dirty-yellow, with brown rings at the base of each segment. Fore and middle legs uniformly brownish-grey. Hind femora grey on the outside and black inwardly. Hind tibiæ dark violaceous, with base almost black; spines pale with black tips. Two basal joints of hind tarsi pale with brown spots; last joint violaceous.

Length of body	.. ..	33 mm.
,, antennæ	.. ..	12, 5
,, pronotum	.. ..	7
,, elytra	.. ..	25, 5
,, hind femur	.. .. ..	15

Arabia: Ktubu, G. W. Bury, 1 ♂ (British Museum).

This species is very well characterised by its coloration, as well as by morphological features, the shortness of pronotum and form of elytra rendering the best characters for separating it from its related species.

46. Pyrgomorpha conica, Ol.—Amara, Mesopotamia, F. P. Connor (Bombay Society).

47. Tropidauchen escalerai, Bol.—Persia, 1 ♀ (British Museum). This species differs from *T. securicollis*, Sauss. by but unimportant characters and is, probably, only a geographical form of the latter species.

48. Tropidauchen cultricolle, Sauss.—Afghanistan: Hari-rud valley, 1 ♂, 1 ♀, 1 larva; Badghis, 1 larva (British Museum).—These specimens have been recorded by Kirby (Trans. Lin. Soc. London, Zool. v, 3, p. 139, No. 11) as *Eunapius granosus*, Stal.

49. Dericorys albidula, Serv.—Persia: Fao, 1891, W. Cummings (British Museum).

1839. *Dericorys albidula*, Serv., Ins. Orth., p. 639.
1853. *Cyphophorus tibialis*, Fieber, Lotos, iii, p. 121, No. 2.
1875. *Derocorys acutispina*, Stal, Bih. Sven. Akad., iii (14), p. 27, No. 1.
1889. *Derocorystes curvipes*, Redt., Wien Ent. Ztg., viii, p. 29, No. 5.
1913. *Dericorys albidula*, Bolivar, Novitates Zool., xx, p. 613, No. 23.

I am fully convinced by the most careful study of descriptions of all above quoted species, that there exists only one large species of *Dericorys*, which is

distributed from Transcaspia to Sahara and from Persian Gulf to Syria. The characters given by Bolivar (l.c.) as separating *albidula*, Serv., from *curvipes* Redt., are not specific but individual.

50. TROPIDOPOLA OBTUSA, sp. n. (fig. 2).

In studying a rather extensive series of *Tropidopola* (12 ♂♂, 13 ♀♀) taken in different parts of the Desert region, and comparing these specimens with those of *Tropidopola cylindrica*, Marsh, from Greece and Macedonia, I came to the conclusion that the desert species is not *cylindrica*, as it has been identified by all authors, including myself, but is well distinct from it. As it, however, agrees with *cylindrica* in all characters, except structure of the head, which is quite different and very constant throughout the series, I think it unnecessary to give a full description of the new species, and the following key together with drawings must be sufficient for separating it from *cylindrica* :—

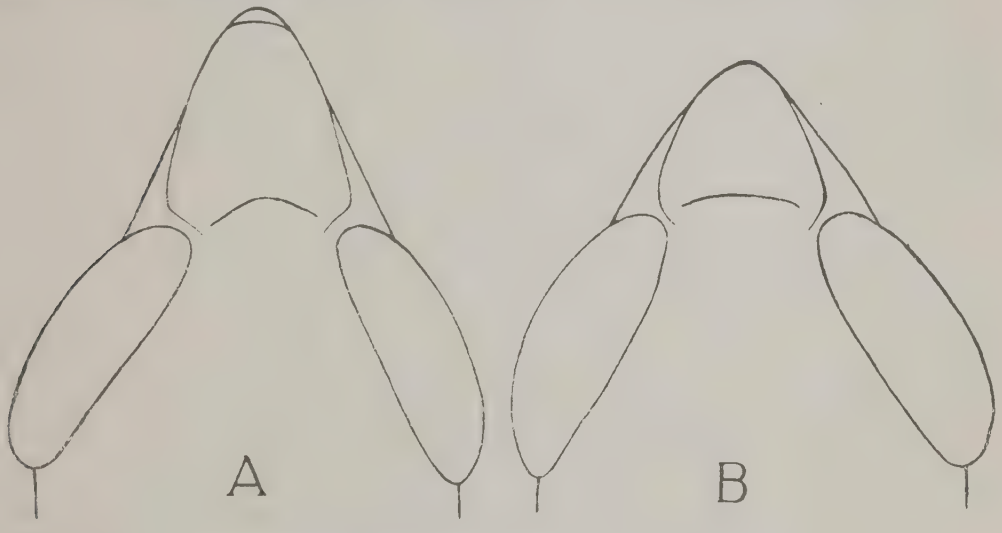

Fig. 1. A. *Tropidopola cylindrica* Marsh.
B. *Tropidopola obtusa*. sp. n.

1 (A) Head not thicker than pronotum, gradually narrowed anteriorly. Front long, more reclinate, in profile quite straight; frontal carinæ straight, converging gradually towards fastigium. Fastigium of vertex (fig. 1) distinctly longer than its base wide; its sides straight, apex subacute. Eyes more elongate. Antennæ distinctly flattened with median joints subquadrate.....*T. cylindrica* Marsh.

2 (B) Head a little thicker than pronotum. Front shorter, less reclinate; in profile slightly convex; frontal carinæ subparallel, suddenly converging between the base of antennæ and fastigium. Fastigium of vertex (fig. 2) not longer than its base wide; its sides convex; apex rounded. Eyes shorter and broader. Antennæ scarcely flattened with median joints distinctly longer than wide. Length of body of the type (female) 35mm.; of pronotum 6, 5; of elytra 26; of hind femur 14, 5.....*T. obtusa*, sp. n.

The type is from Qualat-Salah, Mesopotamia, 6, i., 1918, P. A. Buxton. Other specimens of *T. obtusa* studied by me were from following localities:—

Mesopotamia: Amara, Basra, P. A. Buxton; S. Persia: Fao, D. Cummings, River Karun, Mohamarra, K. C. Mabbs (British Museum); Susa, J. deMorgan (Paris Museum).

Two specimens taken by Dr. Buxton in Mesopotamia (1 ♂ from Basra, 12, viii, 18 and 1 ♀ from Amara, 18, vii, 18) differ from all others by their light green coloration, which is more fresh in ♀, while the male is slightly brownish from above; both specimens are also larger than usual, and have longer antennæ

consisting of more elongated joints, than may be seen in typical specimens of *obtusa*. Without studying a larger series of this form, I cannot decide whether those characters are sufficiently constant to be specific, and I propose in the meantime to designate it as var. VIRESCENS ; n. The dimensions of the typical specimen (female from Amara, Mesopotamia) are, as follows :—Length of body 39 mm.; of pronotum 7 ; of elytra 28 ; of hind femur 16, 5.*

51. THISCŒCELRUS (?) MORBOSUS, Serv.

1839. *Acridium morbosum*, Serville, Ins. Orth., p. 682, No. 44.

1870. *Caloptenus cincticollis*, Walker, Cat. Derm. Salt. Br. Mus. iv, p. 689, No. 29.

There is no doubt though the types of *cincticollis*, Walk., are lost, that this species is identical with *morbosum*, Serv., both insects having been described from Sinai ; I have seen two females from the same locality : Sinai, J. Couayt, 1909 ; desert Arabique, Mahamadieh, canal de Suez (Paris Museum). In British Museum there is one female of this species, which is labelled "Spain" which is doubtless wrong and due to some mistake in labelling. I am not quite sure, whether the species belongs to *Thisœcetrus*, where it is included by some authors, but the question cannot be decided, until male specimens are studied.

52. SPHODROMERUS CŒLEOSYRIENSIS, Giglio-Tos (Fig. 3c, 4c.).

1893. *Caloptenus cœlesyriensis*,Giglio-Tos, Boll. Mus. Zool. An. comp. Torino, viii, N. 164, p. 10, No. 51, fig. 4.

1914. *Calliptamus italicus*, L. ,ab. *carbonaria*, Uvar., Revue Russe d'Entom., xiv, p. 10.

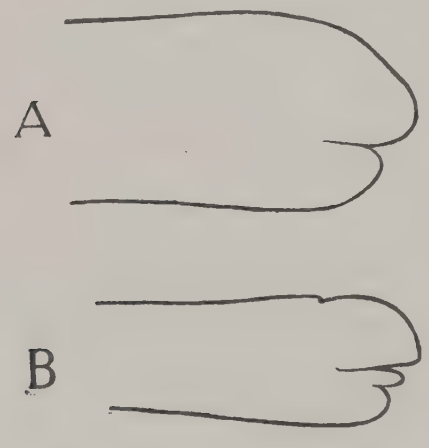

Fig 2. *Tips of the male cerci.*
A—*of Calliptamus cœlosyriensis*, G. T.
B—*of C. italicus, L.*

Shortly after I described *carbonaria* I had the opportunityof studying extensive series of the same insect from different localities in Transcaucasia, Persia and Kurdistan, as well as of making some field observations on living insects, which enables me to state, that it is quite a distinct species from *italicus*, L. The examination of a single male in British Museum from Syria (Aleppo) enables me to identify *carbonaria* with *cœlesyriensis*. The species is rather variable in the development of lateral keels of pronotum and, as its coloration also varies from pitch-black to reddish-grey or clay-yellow, it might be mistaken for *italicus*. It differs, however, from the latter species by shorter and broader hind femora, and, more distinctly, by the shape of end of male cerci, which in *italicus* is armed with two small teeth under the apical lobe, while in *cœlosyriensis* there is only one tooth ; these differences are clearly shown in figures (see fig. 2). This species is distributed from Syria to Turkestan (Ferghana) and from S. E. Transcaucasia to Central Persia (Teheran, in Caucasian Museum ; Pusht-i-Kuh, Paris Museum).

53. THISŒCETRUS ADSPERSUS, Redt.—Mesopotamia : Sinn-Abtar, vii. 16, Shortridge ; Amara, viii-ix, 16, Connor ; Baghdad, 13, ii.17 (Bombay Society).

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* Specimens of *Tropidopola* from Algeria, whence I have studied only three examples, are more alike *obtusa*, than *cylindrica* in the shape of fastigium, but they differ by the frontal carinæ being gradually convergent, as in *clylindrica*. I propose to regard the Algerian *Tropidopola* as a geographical race of the desert *obtusa*, under the subspecific name *algeriana*, subsp. nova (type from Biskra, Algeria, W. I. H. King.

54. THISŒCETRUS DORSATUS, F.-W.—Mesopotamia: Sinn.-Abtar vi, 16, G. C. Shortridge (Bombay Society).

55. THISŒCETRUS PULCHER, Bol.—Baluchistan: Gaza Kalah, 1, ix, 1917, J. E. B. Hotson (Bombay Society).—The species belongs to Indian fauna and this is the most north-western record of its occurrence.

Tettigoniidæ.

56. EURYCORYPHA STYLATA, St.—El-Kubar, N. W. Arabia. G. W. Bury, 2 ♂ ♂ (British Museum).—The genus is essentially African in its distribution and the species is African, as well.

57. EUCONOCEPHALUS INCERTUS, Walk.

1869. CONOCEPHALUS INCERTUS, Walk.—Cat. Derm. Sait. B.M., ii, p. 320.

1891. CONOCEPHALUS BREVICEPS, Redt.—Verh. Zool.-Bot. Ges. Wien, p. 417.

To this species must be partly referred records on the occurrence in the deserts of S. W. Asia of *Hom. nitidulus*, Scop. The above synonymy is established by me after comparison of Redtenbacher's description with Walker's types of *incertus*. I have seen the specimens from the following localities:—Arabia: Fao, 27, x., 91, 1 ♀; Aden, 16, iii, 95, 1 ♀; Mesopotamia: Amara, P. A. Buxton. 1 ♀ (named by L. Chopard as *nitidulus*, Scop); Baluchistan; Omarah, W. D. Cummings, 1 ♀ (all in British Museum).

58. XIPHIDIUM FUSCUM TURANICUM, Sem.—Amara, Mesopotamia, viii-ix, 16-30, v. 17, F. P. Connor (Bombay Society).

59. DECTICUS ALBIFRONS, Cyr.—Mesopotamia: Amara, vii., 16, F. P. Connor; Sinn-Abtar, vii, 16, G. C. Shortridge.

60. TRIGONOCORYPHA ANGUSTATA, sp. n.

♀: Fastigium of vertex triangular, with middle sulcus broad and deep, open anteriorly. Pronotal disc rugulose, very feebly convex anteriorly and as feebly concave posteriorly; fore margin rotundately concave; hind margin circular with a very small emargination in its middle; lateral carinæ straight, feebly convergent anteriorly, more distinctly serrulate in prozona, than in metazona; transverse sulcus feeble, curved backwards in the middle, placed at the end of the basal third; lateral lobes forming a right angle with disc, distinctly higher than long; their fore margin very feebly concave, lower and hind margin widely rounded. Elytra reaching well beyond hind knees; marginal field strongly widened, but near its apical third rather suddenly narrowed, fore margin being distinctly concave and the apex of elytron lanceolato-attenuate; radial veins almost straight; first radial branch bifurcate, second one not divided; hind margin in apical half distinctly concave. Wings longer than elytra, with apex acute. Hind femora with two rows of numerous spinules beneath. Subgenital plate short, triangular. Ovipositor short, strongly recurved.

General coloration brownish (probably decolarated through preserving in some liquid); pronotal carinæ slightly darker; all other parts unicolorous.

Length of body	.. ..	26 mm.
,, pronotum	.. ..	6, 5
,, elytra	.. ..	37, 5
Width of ,, in the middle	.. ..	10
,, ,, in the apical fourth	..	6
Length of wings	.. .. ..	40
,, hind femur	.. .. ..	24
,, ovipositor	.. ..	6

The only specimen of this species is from Fao, Persian Gulf (British Museum).

This is the fourth known species of the genus, the two previously known (*unicolor*, Stall, and *abnormis*, Br. W.) being Indo-Malayan in their distribution, and one has been described recently from Madagascar (*maxima*, Carl, Rev. Suisse Zool., vol. 22, No. 6, 1914, p. 167, pl. 5, fig. 5). Form of elytra in the new species is quite peculiar and the shape of fastigium of vertex, which is completely divided in two lateral parts by middle sulcus, presents another good specific character.

Gryllidæ.

60. BRACHYTRYPES CHOPARDI, sp. n.

♂. Of the size and habitus intermediate between *membranaceus*, Drury, and *megacephalus*, Lef.

Head slightly broader than pronotum. Face flattened, vertical, in shape of a regular circle (its vertical diameter being equal to horizontal one). Fastigium of vertex with a not deep impression in the form of a half-moon. Ocelli as usual for the genus size; the middle ocellus placed a little lower than the line connecting lateral ocelli; the latter placed on the outer side of vertical keels which are distinctly convergent downwards and not extending beyond the base of antennæ; middle facial space between these keels trapezoidal, distinctly higher than broad, with a wide slightly raised coarsely lineato-rugose transverse band; in the middle of which there is a small tubercle with the median ocellum on it; below this band face is rugose, except a smooth shining oval space just beneath ocellum; lower part of face, between bases of antennæ, is slightly convex: below and a little outwardly from bases of antennæ, there are short vertical keels, slightly raised and obtuse. Clypeus with a distinct transverse keel. Occiput strongly convex, raised above pronotum, very sparsely and minutely punctured. Pronotum distinctly constricted in its hind part, but less so than in *megacephalus*; its length exceeds its basal width by a little; its apical width is subequal to one and a half of the length. Disc rugose, with a short smooth median line in the fore half. Fore margin slightly concave; hind margin straight. Lateral lobes a little longer than high, scarcely broadened downwards; fore margin and fore angle broadly rounded; lower margin straight, slightly ascending backwards; hind angle about 100°, rounded; hind margin vertical. Elytra about four and half times as long as pronotum Tympanal field slightly longer than broad. Harpa with three long and 1-2 short oblique veins. Speculum oblique, elongate; its externo-anterior margin straight; fore angle nearly straight, slightly rounded. Apical field occupies less than one-third of the whole length of elytra. Lateral field with 5 branches of radial vein and 8 oblique veins, with feeble transverse venules. Wings fully developed, extending about one-fourth their length beyond the apex of elytra. Fore tibia with a large oblique tympanum on the outer side, and with but a small one inwardly; apical tibial spurs short and obtuse, the two inner ones equal to one-third part of the first tarsal joint; the outer spur about one-half of the inner. Fore tarsi about twice shorter, than tibiæ; first joint as second and third together; its apex seen from beneath oblique, obtusely produced; second joint, equal to one-third of the first; third joint twice as long as second; claws thin, almost straight, with apex bent, acute. Middle tibiæ armed with four thick and short apical spurs, the two inner and lower outer one being subequal in length to each other, while upper outer is shorter. Hind tibiæ armed inwardly and outwardly with 3-4 irregular spines of different size and shape and with six apical spurs; upper inner spur is the longest, reaching about the middle of metatarsus, and incurved; two lower spurs short and rather thin, the inner of them being a little shorter than the outer; three remaining spurs are subequal in length to each other, about one-third of metatarsus, thick, straight. Metatarsus equal to one-half of tibia, armed with three short irregular spinules outwardly and four inwardly, and with two apical spurs, the outer spur being quite short, very thick and obtuse, while the inner reaches about the middle of the third joint of tarsus, thick, slightly recurved, with obtuse apex. Supraanal plate thick, with middle part impressed. Cerci slender long, with long perpendicular hairs. Subgenital plate acutely navicular.

General coloration brownish-pale. Face pale, with the suture between it and clypeus blackish-brown; trapezoidal space upwards from the middle ocellum and its lateral margins, as well as upper margin of antennæ impressions, castaneous: vertex light castaneous, the colour gradually fading in occiput

with a pale median line bifurcate anteriorly, and two darker indefinite narrow submedian longitudinal fasciæ. Pronotum pale with fore and hind part of disc castaneous; the hind castaneous part being twice as broad as the fore one; both are connected by a longitudinal median castaneous fascia, including a pale median line; a round pale point near fore margin and another before hind margin; lateral lobes pale. All legs pale; hind knees with castaneous semilunar patches. Elytra not strongly infumate; wings hyaline, feebly infumate apically.

Length of	body	.. 34 mm
,,	pronotum	.. 6, 5
Width of	,, anteriorly ..	.. 11, 5
,,	,, posteriorly ..	.. 9
Length of	elytra	.. 24
,,	wings	.. 32
,,	fore femur	.. 9
,,	,, tibia	.. 9
,,	,, tarsus	.. 4
,,	hind femur	.. 20
,,	,, tibia	.. 11
,,	,, tarsus	.. 8, 5
,,	,, metatarsus	.. 5, 5

Two males (type and paratype) taken at Ktubu, Arabia, by G. W. Bury in 1902.

I have the great pleasure in naming this interesting species after Dr. L. Chopard, who has done so much for increasing our knowledge of Orthoptera, and especially, of *Gryllidæ*.

The species is somewhat similar to *B. megacephalus*, Lef., but it differs from it in many important characters, as follows:—Head in *B. chopardi* is but a little broader, than pronotum; trapezoidal space between eyes higher than broad, while it is transverse in *megacephalus*. Pronotum in new species is relatively longer, less narrowed posteriorly; lateral lobes distinctly longer than high and but feebly widened downwards. Tympanal field of elytra is distinctly transverse in *megacephalus*, while it is as broad as long in *chopardi*; apical field is relatively longer. Apical spurs of fore tibiæ in *chopardi* are thick and much shorter than first joint of tarsus, while in *megacephalus* they are thinner and longer; apex of first joint of fore tarsi is in new species not truncate, as in *megacephalus*, but obtusely prominent. The larger apical spurs of hind tibiae (*i.e.*, all, except inner upper ones) are subequal to one-third of metatarsus, while in *megacephalus* they are almost as long as a half of metatarsus. From another related species, *B. membranaceus*, the new species differs partly by the same characters, as from *megacephalus*, but is most easily separated by the form of the head, which in *membranaceus* is not wider, than pronotum; pronotum in the latter species is not narrowed posteriorly; median ocellum in *chopardi* is placed on a very small tubercle, while in *membranaceus* this tubercle is very distinct; apical field of elytra in *membranaceus* is distinctly longer than one-third of elytra.

62. ACHETA CHALDEA, sp. n.

♂. Size rather small for the genus, just a little larger than that of *A amarensis* Chopard.

Head distinctly broader, than pronotum, though not as broad comparatively, as in *campestris* L., in profile very little prominent before eyes. Face in its lower part slightly impressed, or rather inclined, forming a very obtuse, but distinct, angle with clypeus; the latter is also subangularly prominent in its middle, if seen in profile; two scarcely perceptible impressions run obliquely from base of antennae towards the middle ocellus, not reaching the latter. Pronotum not much broader than long, equally broad throughout; fore margin slightly excavate; hind margin straight; a feeble median impressed line not

eaching the hind margin; lateral lobes gradually widened anteriorly; their hind margin forming an obliquely rotundate line with lower margin; fore angle about 90°, rounded. Elytra not reaching the apex of abdomen; tympanal area much broader, than long; four oblique veins, the first of which is but feebly developed; speculum rotundato—rhomboidal, with transverse vein curved; marginal field with 5 branches of radial vein and four oblique wings. Wings undeveloped. Hind tibiae rather inflated on the upper side, just beyond the base; both upper margins in apical half sharp; five outer spines, the first of which is about half of the second and each of the rest slightly longer than its preceding; four inner spines thick, distinctly compressed laterally, with sharply attenuate feebly sinuate tips; first inner spine as long as the last of outer spines; three others a little longer; inner upper spur not much longer than the inner apical spine, slightly longer than a half of metatarsus, rather thick and compressed, feebly sinuate; lower inner spur only a little shorter than the upper one and subequal to inner apical spine; metatarsus thick; its upper inner margin rounded, while the upper outer margin is sharp and armed with four sharp spines; inner apical spur of metatarsus thick, compressed, subequal to one-half of second tarsal joint.

Black, slightly shining, entirely non-pubescent. Head and pronotum very finely rugulose. Mandibulae reddish-brown. Eyes and ocelli buff. Elytra dark-brown dorsally and black laterally, Hind femora reddish-brown at the base.

Length of body	20 mm.
Width of head	6, 5
,, pronotum	6
Length of pronotum	45
,, elytra	11, 5
,, hind femur	9
,, ,, tibia	6, 5
,, metatarsus	3
,, ,, tarsus	5, 5

3 ♂ ♂ (type and two paratypes) taken at Susa, Persian Chaldea, 60mt. above sea-level, by J. deMorgan's Expedition, 1904 (Paris Museum; one of paratypes in the British Museum).

This new species belongs to small representatives of the genus and is most nearly related to *A. amarensis*, Chopard, recently described from Mesopotamia but differs from it in the shape of head, clypeus and pronotum, in the more heavy armure of hind tibiae, as well as in relative dimensions of certain spines and spurs of the latter. In its habitus, *A. chaldea* reminds more of *A. campestris* L., while *A. amarensis* is a diminutive form of the type of *bimaculata*, De Geer.

63. Gryllus tartarus obscurus Uvarov.*—Syria, Aleppo, iv-vii. 19, F. C. Aldous (British Museum).

64. Gryllus domesticus *L.*—Mohammerah, Persian Gulf, iii-iv. 17, R. C. Mabbs, 1 ♂ (British Museum).

65. Gryllus desertus Pall.—Syria, Aleppo, F.G. Aldous (British Museum).

66. Gryllotalpa gryllotalpa L.—Mesopotamia. Basrah, 27. v. 16, F. Wall (Bombay Society); River Karun, Mohammerah, Persian Gulf, iii-iv. 1917. R. C. Mabbs (British Museum).

London,
April 1921.

* Entom Month Magaz. 921, Vol. vii. p. 50.

THE IDENTIFICATION OF INDIAN BUTTERFLIES.

By

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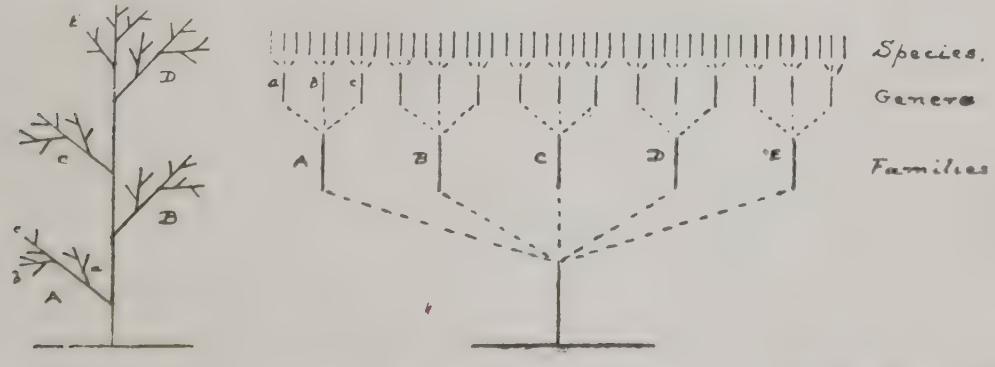
(*With 2 text figures.*)

1. In a former paper, entitled "Butterfly collecting in India," I have described briefly the characteristics of Indian butterflies and how to catch and preserve them. The object of the present article is to explain in simple language how butterflies are to be identified. There are several means of doing this. Perhaps the simplest is to get an expert to do it for one; another by comparison with Museum collections or coloured diagrams and lastly by worrying them out with a text book, such as Bingham's or De Niceville's. Museums and coloured diagrams are inaccessible to the majority of collectors except at rare intervals. Experts are few and far between and often somewhat unsatisfactory, so that the only thing remaining to be done is to work with a text book, which method, I may add is the most satisfactory in the long run. I would warn the reader that the identification of the 1,500 odd butterflies to be obtained in the Indian Empire is no easy matter even for the Museum expert and, unless the subject is studied in a methodical manner, the results are likely to be most inaccurate. Still do not be dismayed; except perhaps for the Blues and Skippers, the names of the butterflies, that are ordinarily to be met with, can be picked up pretty quickly, while the rarer or more obscure species can be put aside until a museum can be visited or an expert consulted.

2. As a prelude to identification it is necessary to understand the system of classification in general use. Now the object of classification is to arrange the specimens being classified in the most convenient manner possible for reference. With the various species belonging to the Animal and Vegetable Kingdoms the accepted desideratum is to follow what is called the natural order of evolution, the lowly bacteria being at the beginning of the list and man, in the opinion of himself, at the end.



The system of evolution may be compared to a tree. Consider the butterflies as represented by such a tree, which has sprung in the distant past from some older tree and so on from the earliest forms of life. Imagine our tree to be composed of a number of branches, from each of which has sprung a number of branchlets and from each of which again there have grown a number of twigs. The twigs represent the various species of butterflies and the problem is to arrange them in the best order possible. The correct solution of the problem is to take the lowest branch and to lay it on the ground; on its right is placed the next branch and so on to the last or topmost; the branchlets are then stripped off and laid above each branch in the same order

finally the twigs are placed over the branchlets. Thus we manage to arrange the twigs or species in a reasonable order. It seems very easy, but unfortunately all that is left of our tree, which has been growing for millions of years, are just a few of the twigs. In some of the other branches of Natural History the Geologist can help the Zoologist to reconstruct their trees by means of fossils, but, as may very well be imagined, he can give us no assistance worth the name with our tree. Thus it may be seen that the problem of butterfly classification is extraordinarily difficult, since all we have to go upon is the study of present day conditions, our knowledge of which may be said to have attained respectable dimensions since the days of the pioneer Linnaeus at the end of the eigteenth century, but, as stated in my former paper, far more remains to be done especially in India.

3. The species is the basis of classification, but what constitutes a species is not so easy to define. Bingham in his volumes in the Fauna of India Series on the butterflies discarded the word as it was so open to misconception and used the word "form" instead. I think it is now generally accepted that, when two so-called forms fly together and do not interbreed, they are to be regarded as species; where they do not fly together and present well defined differences, it is a matter of opinion whether they are to be regarded as species or geographical races; usually if they are structurally similar and of similar habits, it is probably preferable to regard the two forms as races, otherwise they should be treated as species. A number of allied species are grouped for the sake of convenience into what is called a genus. Usually butterflies that differ in structure are placed in separate genera, but no hard and fast rule can be laid down, since certain obviously closely allied species differ materially from each other in this respect, as also do rarely individuals of the same species, while cases are by no means unknown where the structure of the wings on one side differs from that on the other side. Some Naturalists divide genera into sub-genera, but except perhaps in the case of some of the larger and more unwieldy genera this elaboration is undesirable. Genera are further grouped into sub-families and families. A reference to the diagram in paragraph 2 will indicate how the families, genera and species correspond to the branches, branchlets and twigs of the butterfly tree.

4. Without the history of the past to aid him, it will be realised that the Naturalist is groping in the dark when he tries to discover the natural order in which butterflies should be placed. All he can do is to examine the features of each species; to ascertain and tabulate the differences between them in respect of every known character; to decide what value is to be placed on the differences that he has found and finally to adopt a grouping and order that appears most natural. Amateurs are always blaming the so-called cabinet naturalist for changing the classification and nomenclature; I share their annoyance when some delver into the records of the past enforces what is called the law of priority, that is to say, changes a name because he has found that some defunct naturalist had produced some other name prior to the date on which the one in current use had been coined. But when the change is necessitated by a well founded advance in knowledge, the objection is a foolish one. The essential point to bear in mind is that no hard and fast rules can be laid down for the definition of a species, genus, or family or for the value of any particular feature; again and again a character that has been considered above reproach for defining species, etc., has turned out to be a snare and a delusion. The consensus of opinion of the best naturalists of the day is the only guiding principle that can be followed. I am afraid that the leading experts often differ a good deal, but at least the main principles of butterfly classification have now been settled.

5. Having outlined the principles of the system of classification in vogue and its limitations, it is now necessary to consider the various characters on

which it is based and to explain in general terms the value that can be placed on each. Broadly the characters may be divided into two main groups, those appertaining to the early stages and those to the butterfly itself. I will pass briefly over the features that concern the early stages. My reasons are firstly that a knowledge of them is of no use to the amateur who is trying to identify his captures and secondly that they have been very fully described by Mr. Bell in his articles on the "Common Butterflies of the Plains" now being published in the journal; for purposes of classification their importance is paramount. The principal characters are the egg, its shape, size, its delicate ribs and whether laid singly or in clutches; the caterpillar or larva at birth and when full grown, its shape and clothing, whether of hairs, spines or tentacles, etc., the plant it feeds on and whether its habits are gregarious or not; the chrysalis or pupa, its shape and mode of attachment. Let us pass on to the perfect insect or imago as it is technically called. The features to be studied are firstly those pertaining to the body, *i.e.*, the legs, eyes, antennae, palpi and genitalia; secondly those pertaining to the wing, *i.e.*, the shape, venation, cilia, markings and secondary sexual characters. I will not discuss further the genitalia, which are to be found at the end of the body or abdomen, since their examination is beyond the beginner; their study is still incomplete, but since it was commenced, a number of changes have had to be made in the arrangement of various species and genera. The remaining features should be studied carefully by the beginner: the procedure is perfectly simple, if the spirit is willing. To follow the descriptions it is as well to have at hand a freshly killed butterfly of comparatively large size so that it does not dry quickly and which has not been mauled about too much during the process of killing. A good hand lens is a necessity and to make the veins of the wings easily visible apply pure petrol liberally by means of an ordinary fine paint brush.

6. A butterfly has six legs springing from the part of the body known as the thorax and each leg consists of four parts; the coxa or hip next the body, usually rather difficult to see properly; the femur or thigh next to the coxa, usually long and directed upwards; the tibia or shank, also usually long and directed downwards; the tarsus, which is in continuation of and in line with the tibia, is composed of a number of small joints and ends in a single or double pair of claws. The tibia of the foreleg sometimes bears a central spur and on the hind leg it may be furnished with one or two pairs of movable spines. In many butterflies the forelegs are atrophied and unfitted for walking, sometimes, more particularly in the male, appearing as a brush pressed up against the body. Sometimes the legs are curiously swollen, often more or less hairy, while in some species of skippers the male has a prominent tuft of hair on each of the fore coxae or hind tibiae. The differences between the legs have proved of the very greatest importance in defining families and genera, perhaps more so than any other feature. In certain families the sex can be at once indicated by a glance at the forelegs.

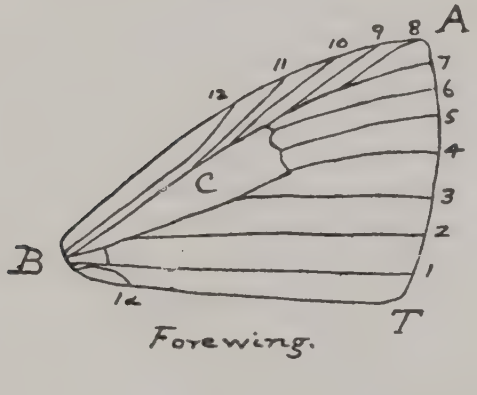
7. The eyes of butterflies are composed of an innumerable number of minute facets; they may be absolutely smooth or covered with hairs, the density and length of which varies with the species. Whether the eyes are smooth or hairy (ciliated) serves very often as a useful and easily recognised character for separating genera. Usually the eyes are black or shining golden brown, but in some of the skippers they are blood red.

8. The antennae are the long feelers that spring from the forehead of a butterfly between the eyes. Usually they are close together at their bases but in the skippers they are wide apart. They may be smooth or scaled, plain or chequered, or smeared with white or ochreous colouring. Their relative length is an important matter, while the shape of the club at the end of the antenna is even more important. In some species, blues principally, there is no club at all (filiform); in others there is just a perceptible thickening at the end (incrassate),

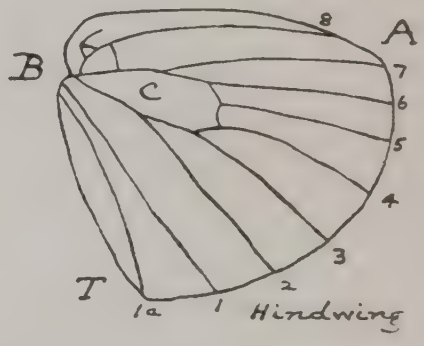
usually there is a well shaped club (clavate or pyriform); the club may be hollowed out below (excavate); in many skippers there is a long filiform end to the club, which is bent over like a hook. The colour of the club varies and there may be a white band below it. The variations in the antennae are often found to be useful in defining genera.

9. The palpi are comparatively large processes, one on either side of the head springing from the edges of the mouth and curving forwards in front of the face and eyes; between the palpi is protruded the proboscis. Each of the palpi consists of three joints, of which the first, nearest to the body, is hardly distinguishable from the stout second joint; the third joint is much narrower and varies very considerably in different species; in some it is needle like; in others entirely concealed in the second joint; sometimes very long and stout; sometimes the third joint is what is known as porrect or extended forwards horizontally or it may be vertical, known as erect. The clothing of the palpi often furnishes a useful means of separating genera; it may be hairy, bristly (or setose) or scaly.

10. The beginner should master as soon as he can the venation (or neuration), that is to say, the arrangement of the veins (or ribs, nervures or nervules) that support the wing membrane and the nomenclature that is employed to describe them. The majority of the genera are based upon venation differences.



Forewing.



Hindwing

B is the "Base" of the wing next the body.

A is the "Apex" and T the "Tornus" or anal angle.

The margin of the wing from B to A is known as the "Costa" or costal margin; from A to T as the "Termen" or outer margin; from B to T as the "Dorsum" or inner margin.

C is an enclosed area known as the "Cell," from which it will be seen that most of the veins spring or have their origin.

The veins are numbered as shown in the diagram.

The vein bordering the upper edge of the cell from the base to the origin of vein 7 is called the subcostal vein (or scv for short); that bordering the lower edge of the cell from the base to vein 4 is the median vein (mv); the veins at the end of the cell between veins 4 and 7 are the discocellulars (dcv); between 7 and 6 it is the upper dcv, between 6 and 5 the middle dcv and between 5 and 4 the lower dcv; the middle and lower dcvs may sometimes be absent.

There are normally 12 veins on the forewing (F or FW for short), but vein 8 and sometimes vein 9 also may be missing. In the majority of butterflies vein 8 and 9 and sometimes vein 10, rarely vein 6 as well, emanate from vein 7, but in the skippers all the veins spring from the cell. In some groups vein 1 (v1 for short) is forked at the base; in others there is a small vein between v1 and the mv; v1a is only present in one group. The veins along the costa are sometimes bent towards each other, occasionally touching and more rarely

completely coalesced or what is called anastomosed. In one group the basal portion of v12, often also of the scv and even of the mv is swollen.

In the hindwing (H or HW) there are only 8 veins, but v1a is present in the majority of species, as is also the short curved spur near the base of v8, known as the precostal vein (pcv). In some species there is a small precostal cell formed either by a small vein between v8 and the scv or v8 and the pcv. Normally all the veins from 2 to 8 spring from the cell, but sometimes vs 3 and 4 may be forked beyond the cell. The middle and lower dcvs as well as v5 may be absent or only faintly indicated.

The secondary sexual characters often cause curious distortions or swellings of the veins.

In the older text books v1 is called the submedian, vs 2, 3 and 4 the first, second and third medians; vs 5 and 6 F and v5 H the discoidal veins, v5 also being known as the radial; vs 7 to 11 F and 6, 7 H the subcostals; v12 F and v8 H the costal. The dcv is sometimes called the transverse vein.

Differences of venation are of variable value in different groups; sometimes a difference will separate whole sub-families, while sometimes well marked differences are to be found between the sexes of the same species. As a rule the differences observable on the forewing are more important than those of the hindwing.

11. The shape of the wings is often an important consideration, though here again the value of the feature is variable; sometimes the seasonal and sexual differences are remarkable. The presence or absence of one or more tails (caudate) towards the tornus of the hindwing is usually important, though there are species, which may or may not have a tail. The tails may be very fine (filiform) or stout and fringed like the rest of the wing (ciliate). The costa may be straight or more or less highly arched and sometimes on the fore wing it is serrate or furnished with teeth like a saw, easily felt by drawing the tip of the finger along it from the tip towards the base; on the hind wing the costa is occasionally concave. The apex may be rounded, sharply pointed or produced in comparison with the rest of the wing; occasionally it is produced and the termen is concave below, when it is termed falcate. The termen or outer margin may be sinuate or wavy, straight, convex or somewhat rarely concave; crenulate or dentate, when produced at the end of each vein and concave between the veins. The dorsum may be straight or concave; sometimes in the males it is highly convex. The tornus of the hindwing is often more or less produced, but more usually it is rounded; it may be angled sharply; sometimes, especially in the blues, it is furnished with a more or less prominent lobe.

12. The cilia are the fringes, composed of two or three layers of scales that are to be found bordering the termens of the wings. They may be cinereous (ashy), white, yellow or brown; or they may be more or less chequered. Their length is variable and often more pronounced at the tornus of the hind wing, where also they may be differently coloured.

13. The differences between the markings on the wings are used to separate species, but here again a word of caution is necessary; the seasonal or sexual differences are often most extraordinary; development under identical conditions often causes the species of widely separated genera or even families to look alike and an examination of the structure is necessary. In some genera the species are so alike that they can only be separated by an examination of the genitalia or of the secondary sexual characters. The variation between the individuals of the same species is often considerable and there is a tendency to the obsolescence of the markings, while so-called sports or mutations are occasionally to be met with. There are quite a number of skippers belonging to different genera which are plain brown insects bearing no markings whatsoever. A few technical terms are used when describing a butterfly, which the beginner should master.

The interspaces between the veins are numbered after the vein next below; thus space 1 is the interspace between veins 1 and 2; the space before vein 1 is 1a and that before vein 1a, when present, is called 1b. Markings parallel to the veins are called longitudinal and those at right angles to them transverse. Markings internal to the centre of the cell are basal; those about a line through the centre of the cell are subbasal; those about a line through the end of the cell are central. The area between the end of the cell and the termen is known as the disc and the markings about the centre of the disc are discal; those before the centre are prediscal and those after the centre are postdiscal. Markings along the termen are terminal or marginal and those just before the termen are subterminal or submarginal. Markings along the costa are costal, those about the apex are apical; those about the tornus are tornal or anal and those about the dorsum are dorsal. The names subapical, etc., are used for markings near the apex, etc.

The colour of the ground generally and of the markings is naturally a matter of importance and is often very difficult to describe in words. Often it is iridescent, presenting a different shade according to the light. Amongst the blues, it is quite impossible to define the exact shade.

The shape of the markings have to be defined. A spot may be annular, if it is just a ring enclosing the ground colour; reniform if it is kidney shaped: the words quadrate, rhomboidal, oval, elongate require no definition. If there is an eye in the centre of a spot, it is called an ocellus and the eye may be furnished with an iris; if there are two eyes the ocellus is called geminate. A band or fascia may be continuous or broken, straight or curved, regular or irregular; if broken or irregular, it is important to note at which vein or space this occurs. A band consisting of more or less conjoined spots is called macular and, if the spots are annular, it is catenulated. A line may be sinuous, or if, as is often the case, it is composed of conjoined crescents, it is lunulate or lunular. Fine lines are called strigae and, if the wing or a portion thereof is covered with fine lines, it is described as striated.

14. The secondary sexual characters to be found in the males of certain species are of various types. Many authors separate off genera on account of differences in these characters, but unless a convenient group is formed thereby, the practice is to be deprecated. The features to be found are tufts of hair on the wings, legs or at the end of the abdomen, which may be recumbent or erectile; brands on the wings in various positions, which may consist of narrow stigmas or of large circular or oval patches and which may be covered with tufts of hair; swollen or distorted veins; pouches on the wings, pendulous or flat; the dorsum of the forewing bowed; nacreous or scale-less patches about the dorsum on the unf or the costa on the uph; pencils of hair that can be extended from the end of the abdomen. Except in a few isolated cases the females are devoid of these characters; in two genera there is a corneous pouch, the shape of which varies with the species, at the end of the abdomen: and in the Blues there is a species with a peculiar tuft of close set fine hairs at the end of the abdomen.

15. The description of a genus comprises the following in the order given:

Forewing (F), shape and venation.
Hindwing (H), do.
Body, Legs, Antennae, Palpi, Eyes.

A note showing how the sexes differ and how the genus differs from its allies.

For a species the description should be given in the following sequence:

Above, general colouring; cilia.
Upperside forewing (upf), shape and markings.
Upperside hindwing (uph), do.
Below, general colouring; cilia.
Underside forewing (unf), shape and markings.

Underside hindwing (unh), shape and makings.
Colour of body, legs, antennae and palpi.

The male (♂) is described first and then the female (♀). Where seasonal variation occurs, the wet season form (wsf) is followed by the dry season form (dsf). Individual and geographical variation is then described, ending with a comparison with its allies and a note on its habits, time of appearance, etc. At the end of the description the expanse should be stated, preferably in millimetres, the expanse of a butterfly is measured from the centre of the thorax to the extreme tip of the forewing and the figure so obtained is doubled.

A butterfly scientifically bears two names, that of the genus followed by that of the species, thus *Papilio polytes*; if the individual belongs to a particular geographical race a third name is added, thus *Papilio polytes romulus*, the first named race (name type or nymotypical form) being *Papilio polytes polytes*. Where a variety has to be specified, a further name is added with the prefix var. or v., and if pertaining to one sex only, the sex sign is also given, thus *Papilio polytes romulus* ♂ v. *cyrus*. After the last name it is usual to add the abbreviated name of the describer, thus *Papilio polytes*, L. (=Linnaeus). Some authors assign latin names to seasonal forms, but the suffixes wsf. and dsf. seem more suitable. Casual varieties and aberrations have been named, but the practice is undesirable, while the naming of slight varieties leads to endless confusion. Dimorphic forms and strongly marked varieties of reasonably frequent occurrence alone seem to be worthy of names as varieties.

16. The foregoing sketch will, I hope, enable the beginner to follow the text books on Indian butterflies, viz.—

The Butterflies of India, Burma and Ceylon; by Marshall and De Nicéville.
Lepidoptera Indica; by Moore and Swinhoe.
Butterflies, Fauna of India series, by Bingham.
The Macro-lepidoptera of the World; by Seitz; the Indo-Malayan section by Fruhstorfer and Jordan.

DeNicéville and Bingham give full descriptions of each species but very few illustrations; they both give keys, whereby the patient student can work out the identification of his captures. Moore gives complete descriptions and a coloured figure of every insect, but no keys. Fruhstorfer gives the briefest of brief descriptions, no keys, but nearly every species is illustrated. It will be found that the nomenclature adopted by the above authors differs very materially, partly because their ideas on classification differed, partly because of the progress of the knowledge in the interval and partly because errors in names required rectifying. When somebody catches a butterfly that he cannot identify and thinks rightly or wrongly that he has a species no one has given a name to, if he considers he is competent enough to do so, he describes it and gives it a name. He is supposed to describe a particular specimen, which is designated the type and if he would only lodge the type in the British or other first class museum, all would be well, since any mistakes he may have made can be rectified in due course. But if, as is so often the case, he keeps the type in his own collection, it eventually gets lost and then the trouble begins; reams may have to be written as to what he really meant, while others catching the same insect may describe it as new. If perchance a name has been used for a species that had already been used in the same genus, then by the rules of priority the name cannot stand and another name has to be coined, but, if later on the species is put into another genus, the old name has to be dug out; and so the game goes on. In the case of genera the rule is that you must not use a name that has been used for a genus already in any of the realms of Zoology, so that the game of changing names is almost as exciting as in the case of species. Owing to our nation not being the only pebble on the beach, the institution of a strict co-ordinating authority is hopeless, though efforts have been made in that direc-

tion with some success. Discarded names are called synonyms and many species have collected quite a number of them.

17. In order to further the study of the Indian butterflies and to popularise it, what appears to be needed is a cheap publication, whereby identification may be effected with reasonable facility. Full descriptions bore the ordinary amateur, while the really earnest student can refer to the text books ; good keys giving the main differences are more acceptable to the majority. Coloured plates are very expensive, but well executed photographs carry one a long way and have the merit of being accurate, which is more than can be said always of hand coloured plates. I propose to follow up the introduction to butterfly catching in India contained in my previous article and the present one by a series of keys accompanied by about thirty plates, containing sufficient illustrations to enable a beginner to spot the genus to which a particular insect belongs, after which the key will enable him to discover the species. The photographs are being taken by Mr. Albert Jeakins of Simla, who being a Naturalist as well as a photographer, is taking the very greatest pains in carrying out the work. An attempt has been made to give trivial names to the species, not the races, since many a beginner will not face the latin names ; I have made an attempt to use the names prevailing at schools in the Hills ; Mr. O. C. Ollenbach has assisted me in selecting the names. The work, which has been carried out in my leisure moments, will not be quite up to the standard it might have reached had I had more time to devote to it and the opportunity of referring to a museum collection or library. It will, I hope, serve a useful purpose and later on it may be possible to produce an improved edition in book form, embodying any suggestions that members may care to make.

18. In order to shorten the work, full use has been made of abbreviations. Where I cannot personally vouch for a locality, I have added the authority in brackets. The families are lettered A, B, etc. ; genera are numbered serially within the family and species serially within the genus ; a particular butterfly can then be referred to as say B14-3. It will be seen that at the beginning of each paragraph in the keys there is a number followed by a number in brackets (in the families key letters in place of numbers), thus 1a (6a), if the description under 1a corresponds, pass on to 1b, if it fails go on to the number in brackets 6a. The reason for using the order 1a, 1b—1 is to preserve the numbering of the species or genus as the case may be, which always follows a number without the small letter suffix. Geographical races are distinguished by Greek letters. No synonyms will be given. I follow the order which appears to me best and most up-to-date. Small print notes will be found at the end of each section explaining any departures from the hitherto accepted practice, notes on any new genera, species or races, etc. ; these notes are intended for the expert and the amateur need not bother to read them ; they will be made as short as possible. Do not expect perfection ; owing to the variation that occurs, the construction of foolproof keys is impossible ; remember too that the aim of the work is cheapness and that it has been executed in the spare time of an overworked official.

Keys to Indian Butterflies.

Families.

Aa (I). F one or more veins emanate from v7. Antennae approximate at the base. Hind tibiae with only one pair of spurs.

Ab (H). H with precostal vein (except a few Pierid æ).

Ac (Ca). Forelegs fully developed in both sexes.

A (B). H v1a absent (present in all other families).

Papilionidæ. The Swallowtails.

B (A). H v1a present.

Pieridæ. The Whites.

Ca (Ac). Forelegs not perfect in both sexes.
Cb (G). Forelegs imperfect in both sexes (except in two genera).
Cc (Ea). F and H cells closed, dcvs present.
C (D). F vi runs into the mv at the base.

Danaidæ. The Danaids.

D (C). Fvi runs into base free of the mv.

Satyridæ. The Browns.

Ea (Cc). H cell open, dcvs absent (slenderly closed in a few cases.)
E (F). Palpi small, narrow and sharp in front.

Amathusiidæ. The Amathusiids.

F (E). Palpi large, broad, rounded in front. F cell usually open.

Nymphalidæ. The Nymphalids.

G (Cb). Forelegs imperfect and brush-like in ♂ ; developed for walking in the ♀ .

Erycinidæ. The Erycinids.

H (Ab). H no precostal vein. Forelegs perfect.

Lycaenidæ. The Blues.

I (Aa). F all veins from the cell or base. Antennae wide apart at the base and often with a hooked club. All legs perfect.

Hesperiidæ. The Skippers.

Notes.—I have followed Seitz in adopting the above order and names; English authors place the Papilionidæ and Pieridæ after the Erycinidæ; treat the Danaidæ Satyridæ, Amathusiidæ and Nymphalidæ as subfamilies of one family, the Nymphalidæ ; call the Amathusiidæ, the Morphidæ and the Erycinidæ, the Nemeobidæ or Riodinidæ. The Hesperiidæ are sometimes treated as a separate suborder under the name Grypocera, the remainder of the Butterflies being the Rhopalocera.

EGRET FARMING IN SIND.

BY

CAPT. C. E. BENSON, D.S.O.

(*With 2 plates*)

Whilst spending a fortnight duck shooting in Sind, I took the opportunity of visiting one or two Egret farms. My object was to try and form some sort of opinion as to whether the method of farming, as practised by the villagers, was satisfactory or not.

There are many difficulties which stand in the way of an individual who attempts to collect true information on a subject that closely concerns the pockets of the people from whom he is trying to collect that information. Not the least of these is, that one is usually mistaken for what one is not. As an instance of this, at Changro, in the Kambar district, near Larkana,—a busy centre of Egret farming,—I was mistaken for a Government of India official expressly sent down from Delhi, for the object of finding some just cause for levying an increased tax on Egret feathers. No assurances on my part could remove this idea from the minds of the villagers. The information obtained there was consequently entirely derived from personal observation, and any other facts, for the truth of which I had to rely on the word of the villagers themselves, were not probably strictly within the bounds of accuracy.

Again, one of the most important features of Egret farming, is the actual method of plucking; for it is in doing this that the greatest cruelty can be practised.

If one cannot witness the actual operation of plucking, the next best thing is to be able to see the bird immediately afterwards. This I was able to do at an Egret farm on the Munnchur Lake near Boubak Road. The Mahanas on the Munnchur themselves proffered a great deal more information than any that I had been able to collect either in the Larkana or in the Kambar district—information that I was able to verify by personal observation. They were no strangers to me and consequently had no suspicions of my having any underlying motive for my enquiries.

Here also I was lucky enough to meet an Excise Officer who had himself countless times witnessed the capture, breeding, transport and plucking of the birds, and consequently was able to add invaluable and reliable information to that which I had already obtained.

In the following table I have endeavoured to collate all the facts of importance, accuracy and interest obtained from the sources above mentioned, avoiding as far as possible any statements which I have not been able to prove either by personal observation or through reliable information.

Though there are many Egret Farms in Sind and I have had the opportunity of visiting only a very few of them, I am nevertheless convinced that the methods practised in one are in the main those practised throughout the whole of that country.

Enclosures for Birds.

1. The size of the average enclosure is about 40 feet long, 20 broad and 5 high.
2. The walls and roof are constructed of poles and matting, or of woven reeds.
3. The floor is of hard mud and the general condition is extremely clean.
4. The number of birds to each enclosure varies from 80 to 120.
5. In some places birds are marked according to broods or enclosures by dyeing the breast feathers.
6. No perches are provided for the birds.

Food and Water.

1. The food supplied consists of un-chopped small fry.

EGRET FARMING IN SIND.

One of the enclosures in a Sind Egret Farm.

EGRET FARMING IN SIND.

Nesting Birds.

Additions to the Family.

2. In all the places visited the supply of these fry was easily obtainable by netting in the neighbouring dhands and they were all fresh and clean.
3. The quantity given per bird per day was sufficient—about 1 lb. a day.
4. Water is supplied in earthenware bowls which are left lying on the ground and of which there are large numbers in each enclosure.
5. This water is obtained either from the well in the village itself, as at Changro where the villagers drink the same water as that supplied to the birds, or from the neighbouring dhand, as on the Munnchur.

N.B.—As the condition of the feathers of the bird is improved by a good supply of both fresh food and water, it is certainly not in the interests of the villagers to in any way stint them of these necessities. In all the enclosures I visited the birds appeared well fed and not in the least hungry, and there was never any visible sign of any shortage of either food or drink, both of which were lying about in every enclosure in large quantities.

Mutilation.

1. No blind Egrets were seen.
2. The terminal joint of the wing of every bird is amputated.
3. Birds are never tethered in the enclosure.
4. Whenever the birds are moved, either by road or rail, the eyelids are sown up. The method adopted is as follows :—

   The lower lid of each eye is pierced by a fine needle and a piece of very fine cotton thread is drawn through. The two pieces of cotton are then tied over the head of the bird, thus causing the lower eyelid to be drawn up over the upper eyelid.

N.B.—With the exception of the Egret farm on the Munnchur very little transportation takes place. In fact the transportation of the birds is almost entirely confined to those times when the newly captured Egrets are brought by rail from the place where they have been originally caught to the farm in Sind which has bought them. As most of the farming is carried on by breeding, there is very little transportation taking place and therefore very little suturing.

But on the Munnchur it is quite different. Here the Mahanas are compelled by floods to move their huts twice a year—once at the beginning of the rains from the borders of the lake to Bubak village, and again back again at the end of the rains. Hence the birds have their eyelids sown up twice a year.

I carefully examined over 50 birds on the Munnchur Lake which had undergone the operation of suturing, but never discovered any visible ill affects caused thereby. But it must be remembered that as I visited the farm in February, no birds had been sutured for the last four or five months.

Extraction of Plumes.

1. All the dorsal plumes of *H. garzetta* are plucked once every three months, just before moulting would naturally take place.
2. The plumes are not plucked one by one, but all together, one man holding the bird while the other plucks.
3. The feathers are held in the centre and are jerked out.
4. The backs of the birds immediately after plucking show considerable laceration and a good deal of blood is drawn during the process.
5. The occipital plumes of *H. garzetta* are not plucked.

N.B.—Curiously enough the bird, during the actual plucking, does not show any obvious signs of pain. There are no bad after effects that I could see. The bird does not sulk but continues, on release, to walk about and feed as if nothing had occurred. What pain there may be would appear to be purely temporary. But from the con-

dition of the backs of the birds which I was able to examine carefully on the Munnchur Lake, I am convinced that the pain inflicted by plucking, as the villagers do it, temporary as it may be, is certainly *very* considerable. It is also hard to believe that there are no permanent after effects, though I never found a single trace of one. The method they adopt however for extracting the feathers in Sind is undoubtedly disgraceful and all the pain inflicted could certainly be avoided.

Breeding and Treatment of Young.

1. When the nesting season approaches, in some cases old Egret nests are provided; in others dried sticks and grass are given the birds with which to make their own nests.
2. Sufficient quantities of nests or of other materials are provided to allow for every pair of birds who wish to nest.
3. No perches are provided and the nest has to be made on the ground.
4. The number of birds in each enclosure is not reduced when the nesting season approaches which leads to over-crowding.
5. The young birds are not removed from the parent birds, nor are they fed in any separate way or on any other diet.
6. The parent birds and their young are placed in separate enclosures and there is no interference with the natural bringing up of the young birds.
7. On the young birds being fledged the terminal joint of the wing is cut and the new brood is then placed in a fresh enclosure, the parent birds being returned to their original enclosure.

N.B.—On the Munnchur the parent birds are allowed to wander free with their young outside the enclosure. But on the young becoming fledged the same procedure is followed as above.

Capture of Wild Birds.

1. Comparatively speaking few wild birds are captured, and the stock is almost entirely renewed by breeding.
2. In the Kambar district the villagers say that they import their new birds from the Punjab and that no trapping of any sort takes place in their district.

N.B.—This is probably not true, but I could obtain little information about this actual fact.

3. On the Munnchur, when wild birds are required, they are captured as follows :—

   A one inch mesh net is staked out on the ground when and where the Mahanas expect the wild birds to come. Round this net are placed stuffed decoys. When the wild bird alights he gets his feet entangled in the mesh of the net and is then easily captured.

   The wing is then cut and the birds are put into an enclosure.
4. There seems to be no special method of taming the newly captured birds.
5. The method of starving wild birds as a means of taming them is not employed.

N.B.—I myself know of one wild bird which was captured, slightly hurt, by a private individual. On being cured, which took only a few days, it was handed over to the Mahanas on the Munnchur who placed it straight into an enclosure with the other already tame birds.

Transportation of Birds.

1. The cages employed for transportation, either by rail or otherwise, are:
   Size :—3 feet by 3 by 3.
   From 15 to 20 birds are placed in these cages.

EGRET FARMING IN INDIA

BY

C. C. Chevenix Trench, I.C.S.

Thanks to painstaking enquiry and persistent re-iteration of the truth by observers in India, there is now no shadow of excuse for any intelligent inhabitant of the United Kingdom to doubt the existence, on a fairly extensive scale, of Egret farms in India, where the birds are kept in conditions favourable to their increase and whence the plumes are exported without the slightest danger to the life of the birds. The charges of 'bribed by the trade' so recklessly levelled by the home-keeping sentimentalist are now a matter of amused and contemptuous recollection. I suggest that the time has come for a brief survey of the position of Egrets in India and for determining the lines along which the efforts of the Society in their behalf should be directed. The following observations are, therefore, submitted, in all diffidence.

(*a*) Egrets (Lesser and Cattle) are at present extraordinarily plentiful nearly all over India. Their plumes are so valuable and so easily smuggled out of the country, that no amount of prohibitive, but unintelligent legislation, will prevent the export trade in *aigrettes*, which continues to-day as it has done in the past, in spite of the Plumage Act.

(*b*) What has saved the birds from partial or complete extermination in the past, is the ignorance, apathy and conservatism of the Indian, *and the Arms Act.*

(*c*) The ignorance,etc., is rapidly disappearing under economic pressure. (In November the Central Provinces are overrun by itinerant middle-men who buy up the plumes from petty local men, and either take them to "a gentleman" in Calcutta or hawk them about Indian cities for a price which, in my experience, ranges from 10 to 28 times their weight in silver). The Arms Act, under pressure of the Reforms, is being relaxed, Provincial Councils cannot for much longer withstand the clamour of the Agricultural classes (70 to 80 per cent. of the population) for unlimited gun licenses for protection of crops, and soon every peasant will, if he likes, possess a gas pipe gun.

(*d*) When both these tendencies come into full play, the extermination of the egret from India is, I consider, certain, and may take place in an astonishingly short time. Because the birds congregate in colonies when the plumes are at their best, and have a distinct tendency to locate their breeding colonies near or even in the heart of villages and towns. Thus they are accessible with no effort and can be killed with the minimum of expense. We have the example of the American Bison to warn us.

(*e*) In the competition between the gun-man and the egret farmer, for the supply of plumes, the latter will go to the wall, unless officially encouraged. No one who has watched the course of the times can doubt that it will soon be cheaper and easier to kill egrets than farm them, nor is there the faintest danger of interference by the local rural police, who, in the rainy, *i.e.*, the breeding season, are powerless.

(*f*) To save the egret the farming of the birds should be encouraged in every possible way, *and the export of farmed plumes permitted under license.*

(*g*) This will be the founding of a virtually new cottage industry in India of which the profits are likely to be very large. The industry can be managed at least as humanely as Ostrich farming. In parenthesis, had it not been for the farming of the ostrich, the geographical range of that

bird would by this date, have undoubtedly been restricted to the least accessible parts of Africa and Asia.

(*h*) On economic as well as sentimental grounds, egret farms should be legalised and the present ill-considered prohibitive legislation which is leading to the extinction of the bird, altered at the next review of the Plumage Act Schedule. This can be done by influencing public opinion in Europe through the press and through leaders of Society. Photographs, propoganda, interviews, etc., are necessary.

In March last I had the honour of interviewing the then Secretary of State for India Mr. Montagu, on the subject. A keen, practical ornithologist himself he listened with the greatest sympathy and undertook to look into the matter again after consulting local Governments in India. But as he is no longer in office, without a fresh effort it is probable that little or nothing will be done.

The chief objection in official circles to the amendment of the Schedule in the direction suggested, appears to be the difficulty they anticipate, on the part of Customs Officers, of distinguishing between parcels of shot, *i.e.*, illicit plumes and farmed plumes. This is a bogey and any Revenue Collector through his staff of Patwaris, Talatis and other Revenue officials, can discover in a single season the number and localities of the protected Egret breeding colonies or Egret farms, in his district. He can also ascertain with equal ease the output in plumes almost to a tola, of each colony or farm. With little or no risk of gross error he will be in a position to 'certify' every consignment of plumes from his district. His certificate will accompany every parcel and state the weight of the parcel covered by it. All the customs authorities need do is to check the weight.

I mention 'colonies' as well as farms because though farming egrets has not yet spread to my own, the Central Provinces, in one district a breeding colony on a riverain island has been protected for 15 years past with great profit by a half-witted Mahomedan, who picks up and sells the moulted plumes which drop at the colony. In 1910 I found this man tending the fire he had lit round the root of the nesting tree to keep off the pythons. There were then about 60 couples breeding. Neighbouring landlords were shooting his birds and after giving him what protection a Settlement Officer could, I left the district in 1912. In 1920 I revisited the colony. It has spread to over 400 nests, and established a branch colony on the mainland. The watcher had become a man of substance, purchased land, married his nieces. He called the colony his village and climbed in and out of the nests without the birds appearing to notice his presence. Spoonbills, snakebirds, little green bitterns, cormorants and purple herons had also joined this happy little republic of 'Cloud-cuckoo town.' He sells his output yearly to a 'gentleman in Calcutta' for Rs. 6/- a tola. The moulted plumes from a colony in the compound of the Police station house in Raipur, C. P., used to be zealously collected and sold till the trees were felled a few years ago.

All the evidence shows that the rural Indian takes very kindly and spontaneously to egret protection and farming. With a little official encouragement, I am convinced that in a few years there would be thousands of farms and protected colonies scattered over the Peninsula and that public opinion would by then dispose of the murderous gun-man. The legislation now in force is an effectual barrier to the realization of this much-to-be desired ideal. Well may the Indian egrets pray for protection from their friends.

ROUGH LIST AND NOTES ON THE BIRDS FOUND BREEDING IN THE GONDA DISTRICT, OUDH.

By

F. Field.

A short description of the physical features of the District will not be out of place. The District of Gonda lies in the north of Oudh, between the outer ranges of the Himalayas and the Ghagra river, which are its Northern and Southern boundaries, to the West is the Bahraich and East the Basti Districts. The District is one of the largest in Oudh, it comprises 2,809 square miles between Lat. 26° 46′ and 27° 50′ N. & Long. 81° 33′ & 82° 46′ E.

The District may be roughly divided into three classes of country. From the Nepal frontier, its Northern boundary is a belt of Government and Zemindari Forest, this belt is roughly from 5 to 10 or more miles in width ; below this is an open and low lying tract, chiefly under rice cultivation, termed '*tarai*,' subject to frequent floods, as innumerable torrents from the hills debouch into this part; this portion is drained by the Rapti river, which practically cuts the District in two.

South of the Rapti, the country is upland, planted over with numerous groves of Mango trees and others, and well cultivated. This upland forms a rather narrow belt, running diagonally across the District ; along this belt flows the Kuhany river, a deep, but sluggish stream, both banks being covered with forests and jungle. Below this high land comes a lower lying tract, rich soil and heavily cultivated with numerous groves of trees. This fertile land is watered by two deep, but sluggish winding rivers, Tehre and Sarjoo. These streams have in the course of ages shifted their beds repeatedly, leaving numerous large lakes and jheels, these lakes are sometimes clear, but usually covered with aquatic plants, wild rice and tall rushes, reeds, etc.

This great variety in the features of the District, giving tracts of dense forest, open plain, country covered by numerous groves of trees with rivers, lakes, marsh, etc., makes it an ideal country for variety of bird life from water birds to the submontane species.

Notes on nidification of Birds of the Gonda District.

No.	Scientific name.	English name.	Remarks.
4	Corvus macrorhynchus.	Jungle Crow ..	Very common, more so than *C. splendens.* Breeds from February to April. Generally away from human habitations. This is a very destructive bird to all small birds, robbing Doves, Bulbuls and all small birds' nests.
7	Corvus splendens ..	Common Crow ..	Common about towns and villages only. Breeds in late May, June.

No.	Scientific name.	English name.	Remarks.
12	Urocissa occipitalis.	Red-billed BlueMag-pie.	Nest and eggs taken in forest North of District under Nepal hills. Nest placed in ' Bandha ' in Rohini tree. May.
16	Dendrocitta rufa ..	Indian Tree-pie ..	Very common. Nests from April to June generally small trees. Destroys numbers of small birds' eggs.
31	Parus atriceps ..	Indian Grey Tit ..	One nest taken from old Nuthatch nest hole, 4 young and addled eggs. March. A pair were building under eves of an Inspection bungalow but were disturbed so deserted it.
105	Argya caudata ..	Common Babbler ..	Common in scrub jungle. Nests in thorn bushes. Has two broods, as eggs have been taken in March and also July. Jerdon's name for this bird should be retained, *i.e.*, Jungle Babbler, as it is only seen in jungle.
110	Crateropus canorus	Jungle Babbler ..	This is the common Babbler: occurs everywhere in the district about gardens, habitations, etc. Builds in trees at all seasons, chiefly during the Monsoon.
226	Zosterops palpebrosa.	White-eye ..	Nest well concealed among large leaves of Mowah, Mango and other trees. April to June.
243	Ægithina tiphia ..	Common Iora ..	A beautiful little cup shaped nest in bushes and small trees. June, July.
282	Molpastes bengalensis.	Bengal Red-vented Bulbul.	Very common. Nests in trees, low bushes, etc. May to July.
288	Otocompsa emeria..	Red-whiskered Bulbul.	Nests in curious positions sometimes. A lot of grass had been cut and stacked, on the top of one of these stacks a pair had built their nest. A very favourite site is creepers against walls. May to July.

No.	Scientific name.	English name.	Remarks.
290	Otocompsa flaviventris.	Black-crested Yellow Bulbul.	Breeds in the forests. Generally in dense creepers, but one nest found was at the top of a fair sized Mango tree well concealed. May, June.
321	Sitta castaneiventris	Chestnut-bellied Nuthatch.	Holes of trees. Entrance partially closed with cowdung, mixed with gum of fig or mango tree. February, March.
326	Dicrurus annectens.	Crow-billed Drongo.	A forest bird. They breed in the forests north of the district making the usual drongo nest in forks of Dhow (*Anogeissus latifolia*) trees. Nest quite conspicuous, 3 eggs usually. Saw a monkey (*M. rhesus*) rob one of their nests, eating the eggs though savagely attacked by bird. Breeds in June.
327	Dicrurus ater ..	Black Drongo ..	Common. Breeds in June. Has two types of eggs, a white and a spotted.
330	Dicrurus cærulescens.	White-bellied Drongo	Also a forest bird, except in the winter when it may be seen in nearly every 'bagh' in the district. It makes the usual Drongo nest in forest trees, placing it in the forks of slender boughs, eggs 3—4. June.
335	Chibia hotentotta ..	Hair-crested Drongo	A purely forest bird. Breeds in the northern forests in June. Nest of the Drongo type in forks of Dhow .trees Eggs 3—4.
363	Acrocephalus stentoreus.	Great Reed Warbler	Breeds among the reeds in some of the large jheels, nests attached to reeds growing in water, and about 18 inches above surface. I believe they have two broods a year as their nests have been taken in May, June and again in July, August. There are two, if not three types of egg.

No.	Scientific name.	English name.	Remarks.
374	Orthotomus sutorius	Tailor Bird ..	Nests built into leaves sewn together, always soft-leaved and low-growing shrubs. June, July.
381	Citicola cursitans ..	Rufous Fan-tail Warbler.	A beautiful little nest, placed low down, almost on ground in thick grass. July to September.
382	Franklinia gracilis.	Franklin's Wren-Warbler.	Breeds in the Tikri jungles in August, nests in low bushes and grass.
392	Chætornis locustelloides.	Bristled Grass-Warbler.	Nest a rather large, globular structure, entrance near the top, made of coarse grass, lined fine grass, down, etc., placed in thick grass near ground. A very shy bird, if she thinks she is observed she deserts at once. Male flies round in circles uttering a tri-syllabic note. Breeds from June to August. Is very locally distributed.
464	Prinia socialis ..	Ashy Wren-Warbler.	Common. Breeds in July, August. Constructs its nest by sewing leaves of some soft-leaved plant together and lining it with fine grasses, down, etc., occasionally they make their nest in *Munj* grass, when the grass is sewn together like the nest of *P. inornata* only, *socialis*, lines her nest and *inornata* does not.
465	Prinia sylvatica ..	Jungle Wren-Warbler.	Only found in the jungles, where they build their nest in small thorny bushes. July.
466	Prinia inornata ..	Wren-Warbler ..	Very common. Nest generally in grass or sugarcane, but also attached to leaves of small shrubs. There are three varieties of eggs found in this district. A blue, a white and a green, all having the usual markings. July to September.

No.	Scientific name.	English name.	Remarks.
469	Lanius lathora ..	Grey Shrike ..	Builds in date palms and thorny trees, common in open plains, Babul jungle. February to April.
476	Lanius erythronotus	Rufous-backed Shrike.	Fairly common, breeds in July. Nests in thorny bushes, bamboos, also trees.
500	Pericrocotus peregrinus.	Small Minivet ..	June, July. Beautiful little cup shaped nest at ends of boughs of small trees, or even bushes.
510	Graucalus macii ..	Large Cuckoo-shrike	Nest, a pad placed high up in tall trees. June. Eggs 2.
518	Oriolus kundoo ..	Oriole	Common, June, July.
521	Oriolus melanocephalus.	Black-headed Oriole.	Breeds in the forests generally but a few in the plains. They migrate in large numbers to the forests to breed in May.
544	Temenuchus pagodarum.	Black-headed Myna	Very common. Nearly every tree has a pair nesting in one of its holes. April, June.
549	Acridotheres tristis.	Common Myna ..	Very common, any hole it can find unoccupied.
551	Acridotheres gingianus.	Bank Myna ..	Holes in wells, also banks of streams. May, June.
555	Sturnopastor contra	Pied Myna ..	Fairly common, but rather local. May, onwards.
576	Cyornis tickelli ..	Tickell's Blue Flycatcher.	Forests. Nest in holes of trees. June.
598	Terpsiphone paradisi	Paradise Fly-catcher.	In forests and plains, but more common in forests. May, June.
604	Rhipidura albifrontata.	White-browed Fantail Flycatcher.	Fairly common. Constructs a beautiful little nest on top of a thin bough, generally a small tree. One pair built on top of tie-rod of verandah. June, July.
608	Pratincola caprata .	Pied Bush Chat ..	March, April. Nests in holes of railway borrow pits, wells, etc.

No.	Scientific name.	English name.	Remarks.
629	Cercomela fusca ..	Brown Rock Chat ..	Has curious positions for its nest. A pair built on a ledge over the door leading into the Judge's Court in Gonda ; two or three pairs on the shelves in a newly built house before the windows were glazed. They invariably build up a sort of parapet of small stones behind which the nest is constructed. June, July.
661	Thamnobia cambaiensis.	Brown-backed Robin.	April to July. Nests in all sorts curious places, holes of walls, of trees, in banks. under bricks, one nest was made in a rat hole.
663	Copsychus saularis.	Magpie Robin ..	March to July. Holes of trees, buildings, etc.
664	Cittocincla macrura.	Shama	The forests North of District. Holes in trees, old Barbet's hole.
686	Geocichla citrina ..	Orange-headed Ground Thrush.	One nest of this bird found, placed on top of a stump that had been broken off, and from which young shoots had grown. A typical Thrush nest. May.
720	Ploceus baya ..	Weaver bird ..	Very common. July to September.
722	Ploceus bengalensis	Black-throated Weaver-bird	Common. Attaches nest to *Munj* grass.
723	Ploceus manyar ..	Striated Weaver-bird.	Common. Same positions as above. Very difficult to distinguish these two birds apart.
734	Uroloncha malabarica.	White-throated Munia.	Very common. Thorny bushes and Babul trees. One nest contained ten eggs.
738	Sporæginthus amandava.	Red Munia ..	Nest placed in thick grass, very well concealed. October, November.

No.	Scientific name.	English name.	Remarks.
775	Gymnorhis flavicollis	Yellow-throated Sparrow.	Holes in trees, one of the most difficult birds to obtain the eggs of you either find none or chicks. April to June.
776	Passer domesticus	Sparrow	Very common.
809	Cotile sinensis ..	Sand Martin ..	Very common. Holes of river banks, wells, even banks of ditches. January, February.
818	Hirundo smithii ..	Wire tailed Swallow	Generally under bridges. One nest taken from a well. February to April.
819	Hirundo fluvicola ..	Cliff Swallow ..	January, under large railway bridges.
823	Hirundo erythropygia.	Sykes' Striated Swallow.	Under culverts, and attached to roofs of old buildings. September.
831	Motacilla maderaspatensis.	Large Pied Wagtail.	Nest with chicks among roots of tree in streams. May.
847	Anthus rufulus ..	Indian Pipit ..	Very common. Grass of fie ridges in fact anywhere whe patches of grass are found.
868	Alauda gulgula ..	Sky Lark	Not common. Nest taken in short grass on edge of jheel. April
866	Alaudula raytal ..	Ganges Sandlark ..	Only one place have I found this bird breeding, this was among sand dunes on the bank of a large lake. Nests placed in tufts of coarse grass. April.
869	Mirafra cantillans .	Singing Bush Lark .	Very local. Open grass plains, borders of rivers and marshes. April, May.
871	Mirafra erythroptera.	Red-winged Bush Lark.	Common, breeds from March to August, probably two broods, nest domed, and on ground, in grass or thorny bush.

No.	Scientific name.	English name.	Remarks.
874	Galerita cristata ..	Crested Lark ..	Season from April to July. Nest built on the ground in stunted thorn bushes.
879	Pyrrhulauda grisea.	Black-bellied Finch-Lark.	Has two broods, one in February to April, another from October. Nest always in open ground generally without any concealment.
882	Æthopyga seheriæ .	Yellow-backed Sun-bird.	Forests north of District. A nest under construction, but bird deserted it after laying one egg. Nest very like that of *A. asiatica*, but without porch. May.
895	Arachnechthra asiatica.	Purple Sun-bird ..	Very common. Builds from March to June.
919	Dicæum erythrorhynchus.	Tickell's Flowerpecker.	Constructs a beautiful little purse-shaped nest, amongst thick bunch of mango leaves, generally quite low down. March to May.
933	Pitta brachyura ..	Indian Pitta ..	Breeds in the forests all along the Nepal border. Constructs a large globular nest in thick thorny shrubs. May.
972	Liopicus mahrattensis.	Yellow-fronted Pied Woodpecker.	Distributed all over District. Nest hole in mango stump generally March.
976	Iyngipicus hardwickii.	Pigmy Woodpecker.	Often seen excavating its nest-hole but have not yet succeeded in finding the eggs. Commences operations in January, but does not lay till March or April.
986	Brachypternus aurantius.	Golden-backed Woodpecker.	Common. Commences to dig its nest hole about January, but does not lay till March, April.
1008	Thereiceryx zeylonicus.	Green Barbet ..	Commences its nest hole in November, but does not lay till April, May.

No	Scientific name.	English name.	Remarks.
1019	Xantholæma hæmatocephala.	Crimson-breasted Barbet.	Very common. April to June.
1022	Coracias indica ..	Indian Roller ..	Holes of trees. April, May.
1026	Merops viridis ..	Indian Bee-eater ..	Burrows in banks, bunds, etc. May, June.
1027	Merops philippinus.	Blue-tailed Bee-eater.	Partially migratory, comes here about March, April when it commences to look out for nesting site. They make their holes in river banks, field bunds, etc.
1031	Nyctiornis athertoni.	Blue-bearded Bee-eater.	Breeds in holes of stream banks in the forests. Nest holes are sunk deep, 8 to 10 feet.
1033	Ceryle varia ..	Pied Kingfisher. ..	Common along all the streams, in the banks of which they nest. January, April.
1043	Pelargopsis gurial ..	Stork-billed Kingfisher.	Several of their nest holes examined but no eggs found, they select the heavily-wooded streams in forests.
1044	Halcyon smyrnensis.	White-breasted Kingfisher.	Fairly common. Nests in banks, either streams, or tanks.
1053	Anthracoceros albirostris.	Indo-Burmese Pied Hornbill.	Common in the northern forests here. Large holes in trees, the entrance to which is partially closed after the female has entered. Whilst she is sitting all her feathers fall off I am told ; how she manages, on being liberated 'informant sayeth not.' Lay in April, May.
1062	Lophoceros birostris.	Grey Hornbill ..	Very common all over this District. Lays in holes of large trees, partly closing entrance after female has entered, the hen does not lay her eggs immediately she shuts herself up, as I have on three occasions dug out the hole to find no eggs, although the male bird was seen feeding her. Lays in May.

No.	Scientific name.	English name.	Remarks.
1067	Upupa indica ..	Indian Hoopoe ..	Common. Nests in holes of building trees. February, March.
1073	Cypselus affinis ..	Indian Swift ..	Local. Builds in buildings, the jail a favorite place.
1086	Macropteryx coronata.	Crested Swift ..	Two nests taken in the northern forests; the nest, a small bracket, is attached to a horizontal branch high up on a tall tree, the egg, a single one, is laid in this. The hen bird sits upright on it, as if she were perched on the bough, not lying as an ordinary bird does; ordinarily you would not suspect that the bird was sitting on a nest at all. June.
1093	Caprimulgus macrurus.	Horsfield's Nightjar.	Common in the forests, lays on dead leaves, no attempt at nest. May, June.
1109	Hierococcyx varius.	Crested Hawk-Cuckoo.	Egg taken in nest of *Argya caudata* with two of the latter birds. July.
1118	Coccystes jacobinus.	Pied Crested Cuckoo	Common in the rains. Lays in in nest of *C. canorus*.
1120	Eudynamis honorata.	Koel	Lays in crows' nests, taken 4 eggs from one nest. July.
1128	Rhopodytes tristis .	Large Green-billed Malkoha.	Northern forests. Large globular nest in thick creepers. June.
1129	Taccocua leschenaulti.	Sirkeer Cuckoo ..	Thick and thorny creepers climbing up trees. April to July.
1130	Centropus sinensis ..	Coucal or Crow Pheasant.	Large domed structure in heavy creepers generally, but I once found one in a Babul tree without a leaf. July to September.

No.	Scientific name.	English name.	Remarks.
1135	Palæornis nipalensis.	Large Paroquet ..	Nests in holes of large forest trees. April, May.
1138	Palæornis torquatus.	Rose-ringed Paroquet	Very common. Holes of trees. May, June.
1139	Palæornis cyanocephalus.	Western Blossom-headed Paroquet.	Common as above.
1141	Palæornis schisticeps.	Slaty-headed Paroquet.	In forests under hills. Eggs not taken, but nest holes examined.
1152	Strix flammea ..	Screech Owl ..	Very local. Lays about February, in holes of trees.
1161	Syrnium ocellatum .	Mottled Wood-Owl.	Common over district in suitable localities. Lays two eggs in hollow formed where branches separate. February, March.
1164	Ketupa zeylonensis.	Brown Fish-Owl ..	Generally spread over District. Eggs 1, 2, in the hollow formed where large limbs separate. Has a deep tri-syllabic call-hoot.
1169	Bubo coromandus. .	Dusky Horned-Owl.	Generally occupies an old nest of a vulture, kite or eagle, usually in a grove of trees, but occasionally on a solitary one, I found one pair had taken up an old *A. vindhiana* nest in a solitary Pipal tree. November to January.
1178	Scops bakkamœna..	Collared Scops Owl.	One nest taken, from hole in mango tree. March.
1180	Athene brama ..	Spotted Owlet ..	Very common. March, April. Holes of mango trees.
1184	Glaucidium radiatum.	Jungle Owlet ..	Lays in holes of trees in March.
1187	Ninox scutulata ..	Brown Hawk-Owl.	A shikari brought the eggs (4) and part of the skin of this bird. He found the nest in the hole of a mhowa (*Bassia latifolia*) in the forest. March.

No.	Scientific name.	English name.	Remarks.
1191	Otogyps calvus ..	Black or King Vulture.	Nest built on top of solitary trees, generally Pipal, January, Febuary. A plucky bird, I sent a man up to a nest on a large Pipal on which the bird was sitting; on the man's approach she went for him, driving him off, he then got a stick, even then she refused to allow him to go near nest, she had a newly hatched chick so I called man down.
1194	Gyps indicus ..	Long-billed Vulture.	Only one nest found, this was on top of solitary Pipal tree ; there was no doubt of the bird as I watched her with binoculars whilst the man was climbing tree. There are numbers of this and *G. tenuirostris* in this District, and as there are no cliffs for them to build on, they have perforce to build on trees. December.
1195	Gyps tenuirostris ..	Himalayan Long-billed Vulture.	I have found three nests of this bird, two contained eggs, the 3rd a chick, two were on top of solitary trees, the 3rd (7th January, 21), a hard-set egg, was an old *P. bengalensis* nest, occupied by that bird only last year. December, January.
1196	Pseudogyps bengalensis.	White-backed Vulture.	Very common. November to January.
1197	Neophron gingini-unus.	Small Scavenger Vulture.	Birds are common, but I have only found 4 nests. One pair have each year used the same site, *i.e.*, about 30 ft. up a Pipal tree, where a large limb separates; this pair have very handsomely marked eggs. March, April.

No.	Scientific name.	English name.	Remarks.
1203	Aquila vindhiana ..	Tawny Eagle ..	A common bird in this District. Breeds from November to January ; places its nest on the very top of isolated trees nearly always a Pipal. Out of 16 nests examined, 7 had one egg each, 8 two, and 1 three.
1217	Spilornis cheela ..	Crested Serpent Eagle.	Breeds along the Kohany river, a thickly wooded and deep stream. Nest in large trees. April, May.
1220	Butaster teesa ..	White-eyed Buzzard	Very common. Nests in thick trees. April, May.
1223	Haliaëtus leucoryphus.	Pallas's Fishing Eagle.	Builds a huge structure, generally on top of some large tree near a lake or jheel. November, December.
1226	Polioaëtus ichthyaëtus.	Grey-headed Fishing Eagle.	Locally distributed; found along well wooded streams or marshes in forests. Builds a large nest, well concealed, about the centre of some forest tree. They use the same nest year after year, even after it has been robbed; what is more, I took an egg from a nest on 9th November, on 6th March I again visited nest and she had laid again in same nest. Again on 15th March next year, the same pair occupied the same nest, I took one fresh egg. On 31st March she was on the nest, on sending up a man there was an egg, slightly set.
1228	Haliastur indus ..	Brahminy Kite ..	Lays in April and May, eggs 1 to 3.
1229	Milvus govinda ..	Common Kite ..	Commences carrying sticks in November, but does not lay till March or even later.

No.	Scientific name.	English name.	Remarks.
1232	Elanus cæruleus ..	Black-winged Kite .	This bird's nest only found this year, it had only two eggs, this was on the 14th December. I have often seen the bird about, but never found nest before.
1244	Astur badius ..	Shikra ..	Generally distributed over the District. Builds in *Bandha* (mistletoe) that is so common on mango trees. April to June.
1249	Pernis cristatus ..	Honey Buzzard ..	Very local. Breeds in May, but very local, chiefly in the northern forests.
1271	Crocopus phœnicopterus.	Bengal Green Pigeon	Builds its usual flimsy nests in small trees ; is very shy of observation ; will desert nest even with egg in it if she sees she is observed. March, May.
1291	Chalcophaps indica	Bronze-winged Dove	Breeds in the forests in May.
1292	Columba intermedia	Blue Rock-Pigeon .	Nests in wells, under railway bridges, under aves of houses, even in holes of trees.
1307	Turtur suratensis ..	Spotted Dove ..	Very common. Nests everywhere and all year round.
1309	Turtur cambayensis	Brown Dove ..	Not so common as last, but generally found all over District. Breeds all year round.
1310	Turtur risorius ..	Ring-Dove ..	The most common dove, lays all year, and in all sorts of places.
1311	Œnopopelia tranquebarica.	Red Turtle-Dove ..	Generally makes its nest in small mango trees in May and June, but I believe it has another brood later.
1324	Pavo cristatus ..	Peafowl	Generally distributed all over District but very plentiful in the forests. Breeds in suitable localities. April to June.

No.	Scientific name.	English name.	Remarks.
1328	Gallus ferrugineus.	Red Jungle-fowl ..	Only found in the forests, where it breeds in May, June. It is wonderful how the young chicks hide, I saw a hen with about 6 or 7 chicks, there was no cover except dry leaves ; we went quickly up, the hen flew off, and the chicks had vanished ; we searched very carefully, so as not to crush any but not a chick could we discover, and yet they were there.
1355	Coturnix communis	Grey Quail ..	Chicks seen in grass and thorn scrub in August, so she must have had her nest near by. The eggs have been brought to L. P. Hutchison by shikari.
1372	Francolinus vulgaris.	Black Partridge ..	Fairly plentiful in the southern parts of District, where it breeds. A large number of their eggs are however destroyed by mungooses, rats, snakes and also crows. I have found numbers of nests with egg shells scattered about. Their chicks too have a bad time.
1375	Francolinus pondicerianus.	Grey Partridge ..	Only found along the jungles. Breeds in May, June.
1382	Turnix pugnax ..	Bustard Quail ..	Plentiful in the grass jungles, where it breeds in June, July.
1393	Porzana pusilla ..	Eastern Baillon's Crake.	One nest of this bird was taken in 1911. Consisted of a few weeds, piled on a water lily leaf, well concealed in wild rice. 2 eggs. August.
1401	Amaurornis phœnicurus.	White-breasted Water-hen.	Very common and a very familiar bird. Frequents village pools, breeds everywhere, generally, nest placed in thick bushes or bamboo clumps. July, August.

No.	Scientific name.	English name.	Remarks.
1403	Gallicrex cinerea ..	Kora or Water Cock.	Nest a pad of wild rice stems pressed down, well concealed in dense wild rice. Eggs 5, 6. August.
1409	Porphyrio poliocephalus.	Purple Moorhen ..	Breeds in the larger jheels, making its nest, which consists of bent down grasses to form a pad, well hidden in growing plants. July, August.
1409	Grus antigone ..	Sarus	A few pairs here and there about the District, where large jheels exist. Nest a huge pile of water weeds, collected together, over which they both labour for weeks. August.
1418	Œdicnemus scolopax.	Stone-Plover ..	Common, no nest, merely hollow in ground, sometimes in a ploughed field, at others amongst scrub bushes. March, April.
1419	Esacus recurvirostris.	Great Stone-Plover.	On sand banks of the larger rivers. June.
1428	Metopodius indicus .	Bronze-winged Jacana.	Plentiful on all the larger jheels, making their nests, a pad of lily leaves, on top of a large leaf, or on lump of grass. Eggs 4. July, August.
1429	Hydrophasianus chirurgus.	Pheasant-tailed Jacana.	Very common on all pieces of water covered with lily leaves, on which they make their nest. July, August.
1431	Sarcogrammus indicus.	Red-wattled Lapwing.	Common everywhere. Eggs taken from April to August.
1433	Sarciophorus malabaricus.	Yellow-wattled Lapwing.	Local, where there are large open plains. Nest, a depression with small clods of earth placed round it. April, May.
1435	Hoplopterus ventralis.	Spur-winged Plover	On sand banks of large rivers. April, May.

No.	Scientific name.	English name.	Remarks.
1447	Ægialitis dubia ..	Little Ringed-Plover	A few pairs breed here, where there are sand dunes near some large lakes. I have only found two nests, one 2 eggs, the other 3. February, March.
1496	Hydrochelidon hybrida.	Whiskered Tern ..	Very local, only breeds in certain jheels in August.
1503	Sterna seena ..	River Tern ..	On the sand islands of the two large rivers flowing through District.
1504	Sterna melanogaster	.Black-bellied Tern .	As above.
1528	Phalocrocorax javanicus.	Little Cormorant ..	Nests in colonies on stunted trees growing in water, along the banks of the Gogra river, where it overflows forming backwaters. In these places a great many kinds of aquatic birds congregate to breed. July.
1529	Plotus melanogaster.	Snake-Bird ..	Along with the previous noted bird.
1542	Inocotis papillosus .	Black Ibis	The only places I have found these birds breeding are on huge Semal (*Bombax malabaricum*) trees on the outskirts of the forests, in May and June. They select a tree on which bees have made their hives, so the only way I could get their eggs was to get the Bhars, who make a living by taking the honey to go up at night.
1548	Dissura episcopus ..	White-necked Stork.	This bird also selects these trees, and generally the same tree as the Ibis, only they occupy one of the lower boughs, whereas the Ibis builds right on top. Here they breed in May, but in other parts they build in July, or later, perhaps they have two broods ?

No.	Scientific name.	English name.	Remarks.
1549	Xenorhynchus asiaticus.	Black-necked Stork.	Makes a huge nest of sticks on top of a high and solitary tree in November, December. On one occasion I found two nearly full grown chicks and two fresh eggs, as already noted in the Journal.
1553	Anastomus oscitans.	Open-bill	Breeds in large colonies, generally on trees growing out of jheels, or on large trees in villages. July, August.
1554	Ardea manillensis ..	Purple Heron ..	Nests placed in, and on dense reeds or on stunted trees in jheels, gregarious. July, August.
1555	Ardea cinerea ..	Blue Heron ..	Builds on large trees, in colonies in July.
1561	Herodias garzetta ..	Little Egret ..	Only found one colony, they were breeding together with *A. grayi* on a Pipal tree in a village on the bank of the Gogra river. July.
1562	Bubulcus coromandus.	Cattle Egret ..	Large numbers breed together on trees in villages. July.
1565	Ardeola grayi ..	Pond Heron ..	On trees in villages. July.
1568	Nycticorax griseus .	Night Heron ..	Large numbers nest together with the little cormorant and snake bird, they also build on trees in villages. I found one colony breeding in the latter place in April, but in the former in July.
1571	Ardetta sinensis ..	Yellow Bittern ..	In thick reeds in marshes. July, August.
1572	Ardetta cinnamomea	Chestnut Bittern ..	One nest in a screw-pine on edge of lake, but usually among thick reeds. August.
1584	Sarcidiornis melanonotus.	Comb Duck or Nukta.	Holes of large trees. July to September.

No.	Scientific name.	English name.	Remarks.
1589	Dendrocycna javanica.	Whistling Teal ..	Among wild rice.
1591	Netopus coromandelianus.	Cotton Teal ..	Holes of large trees. August September.
1617	Podiceps albipennis	Little Grebe ..	A pad of water plants, among weeds, July to September.

List of birds whose eggs have not been taken, but which are believed to breed in this District.

339	Bringha remifer ..	Lesser Racket-tail Drongo.	Occurs in the forests and is a permanent resident.
473	Lanius vittatus ..	Bay-backed Shrike.	Seen in the forests in May, so probably breeds.
495	Pericrocotus brevirostris.	Short-billed Minivet.	Saw a single male in forest, appeared to be feeding female on nest.
1066	Upupa epops ..	European Hoopoe..	Birds seen during breeding season, but nest not found.
1107	Cuculus micropterus	Indian Cuckoo ..	Appears each year in July, calls continuously day and night for over a month.
1112	Cacomantis passerinus.	Plaintive Cuckoo ..	Heard and seen it in June in forests.
1153	Strix candida ..	Grass Owl	Birds seen in grass patches, in October, November. Two eggs brought in by birdcatcher, said to be this bird's, to L. P. Hutchison from just over Nepal frontier. Found in heavy grass.
1168	Bubo bengalensis ..	Rock Horned-Owl..	Birds fairly plentiful along cliffs of forest streams. Eggs not taken.
1173	Scops giu	Scops Owl	Hen bird captured in forest that had evidently been sitting on eggs.

No.	Scientific name.	English name.	Remarks.
1205 to 1206	Aquila maculata or Aquila hastata.	Large or Small Spotted Eagle.	I am not sure which of these birds has built her nest in a large mango 'bagh' for the last two years, I did not shoot it as I wanted the eggs, but I was always too late for eggs, but I saw birds feeding young.
1283	Sphenocercus sphenurus.	Kokla Green Pigeon.	Heard calling in forest in May, June.
1354	Excalfactoria chinensis.	Blue-breasted Quail.	Twice seen pair in heavy grass and apparently feeding young.
1356	Coturnix coromandelica.	Rain Quail ..	Said to breed here.
1416	Sypheotis aurita ..	Likh or Lesser Florican.	Seen in breeding plumage in the large grass patches in the forests, Shikaris say they have eggs in the grass.
107	Argya malcolmi ..	Large Grey Babbler.	This bird is very local, found in small parties in parts of the District where there are patches of Babul jungle, and is a permanent resident, but I have not found the eggs.

LIST OF MOLLUSCA OF RANGOON.

BY

DR. H. MARSHALL.

(A.) FRESH WATER MOLLUSCA.

1a. *Melanoides tuberculata*, Müller.—(F. B. I. No. 28. *Tiara* (*Striatella*) *tuberculata*). This is a common species in Rangoon. The majority of specimens obtainable are very small, and light coloured. Some medium sized specimens were obtained from the Cantonment Garden tanks and Municipal tank in Creek Street. These are very dark in colour.

2a. *Melanoides scabra*, Müller.—(F. B. I. No. 60. *Tiara* (*Plotia*) *scabra*). Specimens of this mollusc were only obtained from the Royal Lakes. They are dark in colour and much decollated.

3a. *Acrostoma variabile* (Benson).—(F. B. I. No. 39. *Tiara* (*Melanoides*) *variabilis*). This is not a very common species in Rangoon. The local variety bears as a rule strong longitudinal ribs and is very dark in colour, some specimens being covered with a thick black deposit. Very occasionally somewhat lighter and more delicate specimens are obtainable and these are marked with two brownish bands on the last whorl. Specimens which are almost smooth and of a light olive colour ornamented with brown bands on the last whorl are sometimes brought into the market with prawns. I have not been able to ascertain as to where these specimens come from.

4a. *Vivipara bengalensis var : digona* (Blanford).—(F. B. I. No. 179. *Vivipara digona*). This is a common species found in almost all tanks, ponds, and ditches. Very beautiful specimens are obtainable in the Kokine Lakes.

5a. *Vivipara bengalensis var : doliaris* (Gould).—(F. B. I. No. 168. *Vivipara doliaris*). Specimens which I take to be this variety do not appear to be anything like as common as *digona*. Most of the specimens obtainable are small. [1]

6a. *Vivipara heliciformis var : viridis*, Reeve.—(F. B. I. No. 185. *Vivipara* (*Idiopoma*) *heliciformis* var : *viridis*. Specimens which I take to be this variety were only found on one occasion.

7a. *Vivipara dissimilis* (Müller).—(F. B. I. No. 174. *Vivipara dissimilis*). Specimens of a uniform green colour with spire not much produced were obtained. I take these to be some variety of *dissimilis*.

8a. *Pachylabra conica* (Gray).—(F. B. I. No. 197. *Pila conica*). This is a very common species in Rangoon. Two varieties are obtainable, one unicoloured which is usually of a large size, the other variously banded with brownish bands. The banded specimens do not appear to reach the size of unicoloured specimens. This species is eaten by many classes of Natives, and many persons are employed in the trade who gather the Molluscs and take them round to private houses for sale. This mollusc along with *Vivipara bengalensis*, *Indoplanorbis exustus*, and *Melanoides tuberculata* are largely collected by the Chinese duck farm owners for the feeding of ducks.

9a. *Limnæa acuminata*, (Lam.)—(F. B. I. No. 211. *Limnæa* (*Limnæa*) *acuminata*). All specimens obtainable in Rangoon appear to be dwarfed. Two varieties have been found ; one something like variety *amygdalum*, Troschel, and the other variety *nana*, Annandale (Rec. Ind. Mus., Vol. XVI, Part 1, No. 6). This species is only obtainable from about October till the end of the year, after which it disappears.

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[1] *V. bengalensis* var : *digona* has now been merged in *doliaris* (Rec. Ind. Mus. Vol. XXII. Part 2II, No. 20, p. 272.)

10a. *Limnæa pinguis* (Dohrn.)—(F. B. I. No. 222. *Limnæa* (*Gulnaria*) *pinguis*). Only a few specimens were obtained but have apparently been mislaid.

11a. *Indoplanorbis exustus*, Desh.—(F. B. I. No. 227. *Planorbis exustus*). This is the commonest fresh water mollusc obtainable in Rangoon. This species is known to carry *Schistosoma spindalis* also a *cercaria* morphologically identical with that of *Schistosoma japonicum*.

12a. *Gyraulus convexiusculus* (Hutton).—(F. B. I. No. 234. *Planorbis* (*Gyraulus*) *convexiusculus*). A couple of specimens were found in the Pazundaung quarter of the town. This species is fairly common in Kamayut just outside Rangoon. Probably *Gyraulus euphraticus*, Mousson, will also be found here.

13a. *Lamellidens marginalis* (Lam.)—(F. B. I. No. 310. *Lamellidens marginalis*). This is a fairly common species in Rangoon. The following varieties have been obtained: (1) *generosus* (Gould). Usually large specimens; (2) *corrianus* (Lea). Not common; (3) *scutum* (Sowerby). Fairly common. There are specimens of var: *zonata* (Desh.) in the Indian Museum collection from Rangoon, but in spite of much searching I have not been able to find any.

14a. *Cyrena bengalensis*, (Lam.)—(F. B. I. No. 328. *Cyrena bengalensis*). After much searching a few living specimens were found at Dawbong and in a drain in Upper Pazundaung Road.

(B.) Land Mollusca.

1b. *Streptaxis burmanicus*, Blf.—(F. B. I. No. 6. *Streptaxis burmanicus*). A single dead specimen (small variety) was picked up in Kemmendine.

2b. ? *Macrochlamys sp.*—This species at first sight looks very much like *Indoplanorbis exustus*. Specimens of this were sent to J. Cosmo Melville and he was of opinion that this was probably a juvenile *Plectophylis*. The specimen sent was apparently imperfect. I am certain that even young specimens are not tomentose.

3b. *Macrochlamys molecula*, Benson.—(F. B. I. No. 195. *Macrochlamys ? molecula*). After much searching specimens have not been found.

4b. *Austenia peguensis*, Theobald.—(F. B. I. No. 297. *Austenia peguensis*). This is a common species at Hlawga which is about twenty miles from Rangoon. Only a single specimen has been taken locally.

5b. This small species was obtained in the Kemmendine Cemetery. I have not been able to identify it.

6b. *Pupisoma lignicola*, Stol.—(F. B. I. No. 49. *Pupisoma lignicola*). This species has been recorded from Rangoon by Hungerford, but I have not been able to obtain it.

7b. *Eulota similaris*, Fer.—(F. B. I. No. 173. *Eulota similaris*). This species is plentiful in Rangoon. All the specimens obtained were unicoloured.

8b. *Eulota sp.*—This is a small, extremely fragile, transparent, highly polished shell. The animal is not able to withdraw itself within the shell. It looks very like a *Eulota*, but I have not been able to identify it.

9b. *Opeas gracile*, Hutton.—(F. B. I. No. 317. *Opeas gracile*). This is a fairly common shell in Rangoon, but no specimens of *Ennea bicolor* Hutton, were found associated with it.

10b. *Succinea semiserica*, Gould.—(F. B. I. No. 448. *Succinea semiserica*). This is a very common species in Rangoon.

11b. *Vaginulus birmanicus*, Theobald.—(F. B. I. No. 478. *Vaginulus birmanicus*). This slug is fairly common in Rangoon.

12b. *Cyclophorus auranticus*, Schumacher.—This species is very localised, but where found is usually plentiful. Rangoon specimens appear to be somewhat like var: *andersoni* (Fauna of Mergui, von. Martens, p. 159)

but more white round the umbilicus. Very young specimens are almost transparent, and mottled with reddish brown. Young specimens before the lip is formed are very deep reddish brown. Full grown adult specimens greyish brown. Very old specimens seem to lose their colour and become almost white, though the peristome never loses its colour.

(C.) River Mollusca.

1c. *Cerithium lemniscatum*, Qusay and Gaimard.—This species is recorded from Rangoon by von Martens.

2c. *?? Cerithidea sp.*—A large specimen something like a *Cerithium* was taken at Dawbong, Rangoon. I have also a specimen from Kyanktan, Burma. Having no books dealing with *Cerithium* and its allies I am not able to say what this is.

3c. *Turritella columnaris*, Kiener.—This species has been recorded from Rangoon by von Martens. I have not been able to obtain specimens.

4c. *Littorina rubropicta*, von Martens.—(Fauna of Mergui, p. 170). This is a very common species in Rangoon. Specimens obtained in Kyanktan, Burma, are much larger than Rangoon specimens.

5c. *Littorina subintermedia*, Nevill.—This specimen was kindly identified for me by Dr. Annandale of the Indian Museum. It is fairly common attached to stones on the banks of the river.

6c. *Assiminia francesciæ ?*, Gray.—These specimens were very kindly identified for me by Dr. Annandale as probably *francesciæ*.

7c. *Assiminia sp.*—These specimens are red in colour and might possibly be *A. brevicula*, Pfeiffer, but unfortunately no books are available giving the description of this species.

8c. *? Rissoina sp.*—These specimens were found on the river training walls. I am unable to say what they really are.

9c. *Larina burmanorum*, Blanford :—This species has been recorded from the Rangoon River (Burma, Its People, and Productions, Vol. I, p. 157). I have not been able to obtain any specimens.

10c. *Neritina crepidularia*, Lam. :—(Fauna of Mergui, p. 171). Black (lower surface) coloured specimens (*Dostia cornucopiæ*) are usually found mixed with typical red (lower surface) specimens. The periostracum varies from olive green to almost black. Some specimens being very prettily marked with black lines resembling somewhat Arabic writing.

11c. *Neritina sp.*—These are small and very dark being whitish below. I at first took them for young of *N. crepidularia* but probably they are a separate species.

12c. *Nerita sp.*—Only one specimen was taken and I am unable to identify it.

13c. *? Siphonaria sp.*—This limpet is very plentiful. I cannot say whether it is really a Siphonaria or not.

14c. *Auricula judæ*, L.—Specimens apparently representing this species have been taken near Monkey Point in decaying vegetable matter. They are not common.

15c. *Auricula sp.*—This is the common *Auricula* of Rangoon, and may, perhaps, be *A. gangetica*.

16c *Pythia plicata*, For.—This species is mentioned by von Martens as from Rangoon. Many specimens have been taken on trees from two localities. (1) trees on bank of tidal drain Lower Pazundaung Road, (2) trees in marshy land exposed to tide near Monkey Point. *Auricula* and *Pythia* have been so far found in the same localities, but *Auricula* has never been seen on trees. *Pythia* appears to be more of a land shell than a salt water species.

17c. *Pythia trigona*, Troschel.—This species is also recorded from Rangoon

by von Martens. It is much rarer than *P. plicata*, only having been taken from one locality in small quantities.

18c. *Turbo margaritaceus*, L.—This species has been recorded from Rangoon by von Martens, but after much searching I have not been able to find a specimen.

19c. ? A single specimen of a Mollusc somewhat broken was found. This is probably a *Littorina* of some kind.

20c. *Mytilus curvatus* Dunker ? :—Some young specimens which might possibly be this were found on the training wall, but I am not able to say really what they are.

21c. ? Two or three apparently young bivalves were taken from the river training wall. These may perhaps belong to the genus *Modiolus*. [2]

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2 *Stenothyra monilifera*, Benson, should be included in the estuarine fauna of Rangoon.

View of the Exhibition in the Mammal Gallery of the Prince of Wales Museum of Western India, on the occasion of the Royal Visit to

THE PROGRESS OF THE NATURAL HISTORY SECTION IN THE PRINCE OF WALES' MUSEUM OF WESTERN INDIA.

BY

B. C. Ellison, C. M. Z. S.

(*With 2 plates.*)

Since the scheme for the arrangement of the collections of the Bombay Natural History Section in the Prince of Wales' Museum was brought out (a synopsis of which appeared in Volume XXVII, No. 4 of the Journal) matters have progressed more or less rapidly with regard to the transference of the Society's collections.

On account of H. R. H. the Prince of Wales proposed visit to the Museum it was decided in August 1921 that the first arrangement of the collections in the New Museum should be made with a view to show him something about the Animal and Bird life of India. An exhibition was therefore arranged of some of the more representative animals and birds found in this country, the specimens being selected particularly from the point of view of sporting interest. By comparing the photos shown in the present number of the Journal and the photos which appeared in Volume XXVII, No. 4, one is able to see the transformation in the appearance of the galleries after three months work. Though not arranged in its final form, nevertheless a very creditable exhibition was made which was favourably commented upon both by the public and the press.

A general guide book to all the Sections of the Museum was compiled, the pages of which gave a brief account of the Natural History Exhibition in the Museum. This was illustrated with a map showing the areas covered by the Society's Mammal Survey and photos of various game animals. A chart was also prepared giving the measurements of the best horns in the Society's collection compared with hitherto published records. Three beautifully bound copies were presented to H. R. H. The Prince of Wales, the Viceroy and to H. E. the Governor of Bombay respectively in which were included some of the beautiful plates which have appeared in the "Game Birds of India, Burma and Ceylon" by E. C. Stuart Baker, F.Z.S., etc.

The principal exhibit in the Mammal Gallery illustrated the work of the Society's Mammal Survey. Along the central row of tables a series of skins ranging from Primates to Pangolins were grouped according to classification. These were further embellished with photographs and maps showing distribution, etc. A separate exhibit illustrated the large number of genera and species which had been added to the list of the Indian Fauna through the agency of the survey. The Society's fine collection of Big Game Horns was shown to very great advantage on the walls of the gallery.

An endeavour had been made to procure the best photos possible of Indian animals shown under natural conditions. Through the kindness of many of the Society's sporting members a good representative collection of these were obtained and were enlarged and framed and placed underneath trophies or side by side with the unmounted specimens. In addition to the enlarged photos were numerous others sent by members from all over India. These were shown especially for people interested in Big Game Shooting. There was a magnificent collection of fine photos presented by H. H. the Maharaja of Bikaneer and numerous members. H. H. the Maharaja of Dhar, Mr. J. Ridland and others lent their trophies for the exhibition. One cannot but comment on the beautiful

Tiger skins loaned to the Society by the latter gentleman. These formed an extremely striking exhibit on the walls of the gallery. The labelling of the exhibits was a matter that demanded particular attention. Experience has shown that the ordinary type of label is very apt to rapidly deteriorate under local climatic conditions, and a satisfactory expedient was found in having all the large printed ones framed under glass *pari passu*.

In the Bird Gallery (which had been temporarily housed in the Gallery marked (β) in the general scheme) perhaps the most interesting exhibition besides the splendid display of skins and paintings of Indian Game Birds was the portion allotted to Egrets in the little gallery at the end of the alcove. Through the kindness of the Commissioner in Sind, specimens of these birds procured from the farms, together with samples of plumes and photographs of the birds in various stages of development, were shown.

The method of exhibiting specimens by means of plaster casts whereby a number of Mr. Prater's beautiful life-like casts of the commoner Indian snakes were shown, attracted considerable attention.

The Natural History Section was open to the public for a week during the time of the Prince's visit. Sir Perry Robinson, Special Correspondent of *The Times*, was one of many who spent an afternoon in the Natural History Section. He wrote a very appreciative article on his visit.

The expenses incurred in connection with the transfer of collections, including the cost of tables hired and purchased, amounted to Rs. 10,068.

The impression gathered by the visitor in many Museums is one of mustiness and decay. This has rather the effect of detracting much from the utility of these institutions, and turns them into caverns of mouldy antiquities. Every effort, therefore, was made in the present instance to avoid the above effect. Our object being to interest as well as to instruct.

Early in January His Excellency the Governor and Lady Lloyd paid a private visit to the Natural History Section. Their Excellencies were met by the Managing Committee of the Society and conducted over the Section by Mr. R. A. Spence and Mr. Prater. The writer was unable to be present on the occasion being in Nepal at the time. Their Excellencies expressed themselves very favourably as to the arrangement of the section. His Excellency showed a great interest in its future and very kindly promised his assistance in furthering the plans put forward by the Honorary Secretary, which were chiefly concerned with the question of funds and the ways and means of their acquirements.

The great drawback affecting the running of Museums and kindred institutions in India as elsewhere seems to be a cramping lack of funds. The writer is of opinion that disadvantageous as it may seem to the aims of a public institution such as a Museum, a small charge to visitors on every day of the week, except perhaps one, would go far towards remedying this deplorable condition.

The exhibition hitherto arranged was purely of a temporary character and the specimens arranged on tables, etc., could not possibly continue in their present condition without the risk of infinite harm. Unless properly protected under airtight cases they become an easy prey to the attacks of *Dermestes* and mites. It was decided, therefore, to disband the present exhibition until suitable show cases had been provided for the housing of the collections. Arrangements were speedily concluded with Messrs. Chung Sang & Co. of Calcutta who had already erected cases for the Art and Archaeological Sections and who had had considerable previous experience in the construction of cases for Museums. Designs for their arrangement were prepared and approved of. One cannot but comment on the valuable assistance rendered by Mr. Prater who during the

The Game Bird Section as seen at the time of the Exhibition.

"In Perpetuam Rei Memoriam."

One of the Society's old rooms at 6, Apollo Street. Its overcrowded condition will show the urgent need there was for additional space.

writer's absence on the Prince's shoots at this critical period had the onus of this work thrown on his shoulders. A considerable saving in the cost was affected through the Honorary Secretary, who previous to accepting the local estimates for plate glass cabled for the current prices in England with the result that the estimate was reduced by the substantial sum of Rs. 16,000.

The cases for the Mammal Gallery which are now completed; have been designed on the latest principles; they are air-tight and constructed of the best seasoned teak available.

The next question before us is the filling of the cases. The problem of mounting animals was one that required considerable deliberation. The usual policy in the past was to have the animals mounted by a Taxidermist attached to the Museum. The man was usually poorly paid and had the vaguest notion of the work he was attempting to do. This often resulted in a horrible collection of monstrosites. Taxidermy is at the present day a fine art, and in England and America is attracting quite a superior type of man to the bird stuffer of old. After consultation with Experts in England and comparison of the estimates proffered by one or two well-known Taxidermist firms in India, it was discovered that it would be decidedly more advantageous if the Museum could secure for itself either the services of a trained taxidermist to mount the animals himself or some one with sufficient knowledge to supervise the carrying out of this work. It was, therefore, decided to send the Society's Assistant Curator to England in this connection. We are fully convinced that the course adopted will be of extreme advantage to the Museum.

As regards the remaining galleries funds will not allow of our touching these until we have completed the Mammal Gallery. When this is finished it is proposed to take up the Bird Gallery and then the remaining sections.

Many members will be wondering about the old rooms in Apollo Street, clinging to which are a host of memories. These are and will still continue to be the offices and headquarters of the Society and here will still be housed the reference collections. Except for the giving up of one room, and sundry gaps and vacancies on the walls caused by the transference of trophies to the Prince of Wales Museum (these gaps are being rapidly filled however) the old rooms continue the same as formerly. *In perpetuam memoriam,* we publish the photo of the room no longer tenanted by the Society.

BOMBAY NATURAL HISTORY SOCIETY, 12*th June* 1922.

REVIEW.

THE EDGE OF THE JUNGLE. By William Beebe, (Witherby). 12*s*. 6*d*.

The 'Edge of the Jungle' is a series of essays on observations of Natural History in Guiana.

The author Mr. William Beebe has travelled widely as a scientific naturalist: he is apparently mainly a biologist setting up a laboratory wherever he goes in the jungles, but he is also a very close and careful observer of Nature, and his record of the daily routine of a nest of Army Ants watched at the risk of extreme discomfort is of the greatest interest.

Unfortunately Mr. Beebe has gained a reputation for language "holding all the charm of an essay by R. L. Stevenson" (*vide* wrapper), and he laboriously and self-consciously upholds that reputation by giving us fifteen annas of fine writing to every anna of information, which is not, by the way, the method of R. L. S. The result is that in this book we find many tantalising allusions to Mr. Beebe's experiences in Borneo, Egypt, China and the "Queen's Golden Monastery in Northern Burma within storm sound of Tibet" and almost the only thing we learn about the Natural History of Guiana is that the mongoose (described of course *a la* R.L.S. as "that furry fiend Rikki tikki") has been introduced into the country, and is 'having a rather hard time of it.'

We in India perhaps hardly realise what a literature of Natural History and Sport has been built up for us by plain men telling us what we want to know in plain language.

The model of all books on the wanderings of a Naturalist, though we cannot claim it for India, is Wallace's Eastern Archipelago. But in India we have writers like the "Old Forest Ranger," Simson, Hume, Marshall, Eha, Stuart Baker to take only the first names that occur: and all of these tell their stories in a way that appeals at once and directly to anyone who has ever taken a bird's egg or held a gun.

Mr. Beebe does not succeed in making the same appeal nor does he probably desire to do so. He is writing for a public which you may call more cultured or more sentimental as suits your fancy, and he has no doubt a very wide and enthusiastic circle of admirers, and he very justifiably from his own point of view considers us lacking in the finer sense of taste, in that we should have preferred to find in his book rather less vivid word painting and a good deal more about the Natural History of a fascinating country.

THE LATE MR. R. C. WROUGHTON, F.L.S., F.Z.S., M.B.O.U.

"It was typical of Wroughton's indomitable energy of spirit that he should, after 70, and suffering from the grave illness of which he died, have planned and started on such a monumental work as a new Blanford. But this was the key to the character of the man. No work was too laborious, too great, or too difficult for him to start on, if life were given him to carry it through to a successful conclusion."

Oldfield Thomas

EDITORIAL.

Mammal Survey.—We have much satisfaction in acknowledging the receipt of a grant of Rs. 45,000 from the Imperial Government of India towards the expenses of the Mammal Survey. This grant was paid to the Society in two instalments of Rs. 22,500 for the years 1921-22 and 1922-23 respectively. The Mammal Survey has been further benefited by a grant of £ 100 from the Royal Society and a donation of £ 50 from the Zoological Society of London. It is with much gratification that we record these marks of appreciation on the part of the Indian Government and the premier learned Societies of the Empire. Our thanks are also due to all those members of the Society who gave us their generous support at a time when funds were urgently needed by the Society to complete the task it had set out to accomplish.

With the financial aspect more or less assured the Society confidently hopes to complete the Survey as originally planned. Four collectors are at present engaged in the work. Mr. C. Primrose has recently completed the Survey of the Mergui Archipelago and Mr. Oldfield Thomas has written very appreciatively of his work among those Islands. Owing to the impracticability of continuing his work in Burma during the monsoon, Mr. Primrose has been transferred to Gwalior and our thanks are due to H. H. The Maharaja for permission accorded to our collector to work in his territories and for the facilities promised him. Mr. Wells is working in the Kangra District in the North Western Himalayas. His report recounting his experiences of " Scrambling over frozen snow slopes " reached us in Bombay on a particularly vicious day at the latter end of May. It is to be recorded that the temptation to exchange the office chair for a collector's gun was successfully overcome. Our third collector Mr. McCann is carrying on the Survey in the Palni Hills in Southern India. He proposes to descend to the plains during the monsoon, his future venue being the Salem and Trichinopoly Districts. The Society will be grateful to members in Southern India for any assistance they can accord him while in their districts. We are pleased further to report, that permission has once more been obtained from the Nepal Government for N. A. Baptista to resume the Survey work in that country, where Col. W. F. O'Connor, the British Envoy, has very kindly agreed to take over the work of his predecessor Col. R. L. Kennion in supervising the arrangements.

Members are aware that the material obtained through the Agency of the Survey is being worked out at the British Museum by the members of the staff and also by the aid of voluntary workers such as the late Mr. R. C. Wroughton and Mr. T. B. Fry. Mr. Oldfield Thomas in a recent letter mentioned that there would shortly be a possibility of our having to secure the services of some one who would be willing to take over the work of cataloguing and labelling the Survey material. He writes that there must be many retired officials in England, who are simply pining for the want of something to do, who would be ready to take up this work as a hobby. Whether they take up the scientific side of the work or attend merely to its routine nature, they would in either instance be doing work of much value and would be rendering a great service both to the British Museum and to the Survey. Both Mr. Wroughton and Mr. Fry came to the Museum after retirement from official life and Mr. Oldfield Thomas would be glad to hear from any of our members who would be willing to help in any way.

Bombay Fisheries.—When in 1917, the newly formed Government Department of Industries turned its attention to the fishing industry of the Presidency with a view to its development and improvement, and

declared in its first annual report (for 1917-18) its appreciation of the need for scientific investigation, it seemed as if our authorities had at last become alive to a public duty recognised and acted upon by all civilised maritime countries, which had here been too long ignored.

A decided step forward was taken in 1918, when it was resolved to acquire a steam trawler to investigate the unknown fishery resources of the deep sea, and at the same time to secure the services of a "Marine Biologist with knowledge and experience of the scientific and economic sides of the industry, who will investigate the resources to be exploited and make proposals for the means of doing so and the necessary organisation."

The above is quoted from the annual report of the Department of Industries for 1918-19, which further goes on to say : "This is a field for Government endeavour analogous to the exploration of the country's mineral resources by the Geological Survey of India."

The Director of Industries qualifies and dilutes this point of view by adding: "In the case of fisheries, however, I consider that mere exploration work should, at the outset, be subordinated to the policy of ascertaining definitely whether trawling will or will not pay in Bombay waters. If it does pay, and perhaps even if it does not pay, there will probably be for many years to come a rich field for scientific and economic enquiry." By trawling here is apparently meant the operations of the Government's experimental vessel.

It appears to us that the Department of Industries showed an undue haste to get down to a commercial basis. Borrowing its own metaphor of the Geological Survey he would be a very short-sighted geologist who limited his attention in the field only to those minerals which could be immediately disposed of at a profit.

The fishing scheme materialised in the appearance of the Steam Trawler "William Carrick" at Bombay in March 1921, and trawling operations were begun towards the end of May 1921. The exploratory object appears from the outset to have been subordinated to the catching and landing of fish for the market. The experiment of placing trawl-caught fish upon the Bombay market was doubtless an interesting and necessary one, but it is obvious that making the marketing a primary consideration would be a handicap to systematic sea work and would make substantial inroads into the time available for the exploration of the virgin fishing grounds which are sufficiently vast in any case for a single vessel to trawl over. To put exploitation *before* exploration was on the face of it a case of putting the cart before the horse.

We are informed that the operations were not a commercial success as at no time did the proceeds from the sales of fish approach anywhere near the working expenses. It was doubtless this circumstance, in the face of the financial straits in which the Government found itself in budgeting for the financial year 1922-23, which led to the abandonment of trawling at the end of last February, after a working period which barely exceeded 9 months. It seems a sad and untimely fizzling out of a big project which must have involved the Government in a very substantial capital outlay-substantial enough to merit a longer period of activity one would imagine. Our present knowledge of the natural history of the food fishes of these parts is practically *nil* and therefore the publication of the details and the results of the work will be awaited with much interest, but it is clear that a fishery survey of the seas of a province with over 1,000 miles of coastline cannot have been carried very far in so short a period. It is to be hoped that although the Bombay Government has not been able to maintain its deep-sea trawling project—admittedly an expensive matter in the hard

times of to-day—it will nevertheless realise that the natural resources of the sea, no less than those which flourish on the face of the earth or lie buried beneath its surface, have a considerable present and still greater potential value to the state and to posterity.

The present prospects for the continuance of fishing investigations are somewhat blank. There appears to be no provision for the appointment of a successor to the Marine Biologist who returns to England at the end of the year; and the post of Assistant Marine Biologist which was only filled for a matter of about 5 months has been abolished, one of the *minutiæ* of Government economy.

The inconclusive ending of a costly enterprise emphasises the fact that experiments of this nature are foredoomed to failure unless their conduct goes hand-in-hand with scientific investigation, and, if possible, under the direction of someone who combines knowledge of local fishing conditions from both the scientific and practical sides. We are satisfied from many facts already known that power-fishing—not necessarily steam-trawling—will some day become one of the great industries of the Bombay Presidency, and that the present setback is purely temporary and due to faults in the conception and carrying out of the scheme. What is wanted is enlightened commercial control working in close collaboration with informed (practical) scientific advice. It is evident that wide local knowledge of the life-history and habits of our food fishes is essential to ensure success. We must know at least the salient facts about them, their breeding seasons, spawning grounds, and the main factors controlling the periodic migrations that are outstanding characteristics of some of our most valuable marketable fishes. Knowledge of this description intelligently applied will assuredly enable our sea-fishing industry to develop on modern lines and so obtain the largest possible quantities of fish in the best condition upon an expenditure low enough to permit of sale at reasonable prices; perhaps in no other industry depending directly upon the spontaneous produce of Nature, can the possible result so amply repay the capital and labour expended upon it. But the practical scientist (zoologist) is essential to success and it is also needful that any extensive steam or motor fishery organization should have strong and patient financial backing and should be run in conjunction with a well-thought out and extensive cold-storage and distributing agency. It is probably an easier proposition to catch the fish than to dispose of the catches at remunerative rates. This is work that no Government department can tackle satisfactorily; Government should confine itself to the investigations that are needful to supply the data essential to commercial success and should not try directly and through their own organization to develop commercially such capitalistic methods of fishing as steam-trawling.

The Administration Report of the Department of Fisheries, Madras, by the Director, Mr. J. Hornell, F.L.S., F.R.A.I., just to hand makes very interesting reading. Although such a department should not be considered a profit-earning department, as its resources should be devoted primarily and principally to investigation and research in the interests both of the fishing industry and the general community, it manages to cover the greater part of its expenditure by profits made on the departmental tank fishery and from the improvement of inland waters. The latter source of revenue is particularly noteworthy. The Department takes over tanks and rivers from the local authorities on payment of yearly compensation based on past rentals received, and then by applying up-to-date pisciultural methods for the improvement of these waters, is able to obtain largely increased rentals, which pay all the expenses of the section and leave a handsome surplus that goes far to cover expenditure

upon scientific investigation that is not and cannot be directly productive however valuable its conclusions may eventually prove to the industries concerned. If the Director's programme of research continues to be adequately supported by Government, about which some misgivings are felt, the operations of the Madras Department of Fisheries should become one of the greatest economic assets of that Presidency. The operations of the department have constantly expanded since its inception and include among other minor lines, a Zoological Supply section which we have much pleasure in bringing to the notice of schools, colleges and other educational establishments in India. The scheme was inaugurated by Mr. Hornell with the object of supplying schools and colleges where zoology is taught, with type and dissection specimens of our marine fauna for study in the class room. Until then, students to a large extent relied upon a study of text-book figures and had little or no familiarity with the animals themselves. They could describe a sea-anemone or a holothurian with exactitude, but would fail to recognise either if they saw it alive in a rock-pool or on the sea shore. For school museums, Mr. Hornell has had prepared wall cases of typical mollusca, crustaceans and sponges. To render these more useful, he is engaged upon the preparation of illustrated handbooks descriptive of the types represented in these cases ; the first one, dealing with South Indian shells, has just been issued and he hopes shortly to complete a companion work on the larger Indian Crustacea, to illustrate a collection of our common crabs.

Readers of our Journal will be interested to learn that Mr. Hornell has promised to write a series of descriptive papers on the common marine and fresh-water shells of India. In the present number of the Journal, we publish a paper by him on the Madras Aquarium while a future issue will contain a very interesting article on the Commensals of Indian Crabs and Alcyonarians.

Nature Study in Schools.—While on the subject of Nature Study in schools we are pleased to state that as a result of representations made by the Society Government has been pleased to appoint a Committee "to consider and report on the question of arranging for the formation, in co-operation with the Bombay Natural History Society, of a Nature Study Museum in Bombay, for the use of teachers and students of the subject." The Committee will enquire into and submit proposals on the most advantageous methods of exhibiting suitable portions of the Society's collections to European and Indian children in Government and recognised schools and will report on the best manner in which the Society can render guidance and assistance to teachers. The Committee thus constituted will also serve as a Standing Advisory Committee in future and will meet once a year to settle the lines of work. Mr. R. A. Spence has been appointed the Society's representative on the proposed Committee and during his absence on leave in England, Revd. Father Blatter, S.J., F.L.S., will take his place.

Egret Farming.—In the present issue of the Journal we publish articles by Capt. C. E. Benson and Mr. Chevenix Trench, I.C.S., on the subject of Egret Farming. Members of the Society will recall the previous papers on the subject by Mr. G. Birch published in Vol. XXIII, No. 1. At the time of its publication Mr. Birch's article roused considerable comment in England, especially during the period the Plumage Bill was before Parliament. Last year a proposition was afoot for a Government enquiry into the status of these farms, particularly with a view to establishing whether cruelty was being practised. The matter however was dropped for no very apparent reason. There can be little doubt that an enquiry into this subject must eventually be undertaken. Numerous

unsupervised farms which have sprung up in suitable localities throughout the Province and the information to hand seems to indicate that the farming of egrets on humane lines is not an impossibility and that the cruelty at present practiced could be abolished. The present method of 'plucking' as observed by Capt. Benson is both cruel and reprehensible. The suturing of the eyelids appears to be practiced only by a small section of the farmers who are compelled to transfer their establishments at seasonal periods. We once more urge upon Government the necessity of establishing the proposed enquiry. It will take time as the birds must be visited in the middle of the Sind hot weather, July-August, in the cold weather and in the early spring, but provided that the right men are sent and sufficient time given for a thorough investigation a valuable report could be obtained.

We draw the attention of members to the excellent series of articles on the collection and identification of Indian Butterflies by Col. Evans the first of which appeared in Vol. XXVIII, No. 2. Col. Evans is supplying a very much felt want, *i.e.*, a guide to the budding collector and to the recognition of the more common Indian Species. The series of articles will be illustrated with black and white photographs of various species and will be a great help to a large circle of people who are at present prevented from taking up a fascinating study for want of suitable and helpful literature. We have already commented on Mr. Hornell's proposed papers on the Common Molluscs and are pleased to announce that a popular paper, on similar lines, on Spiders and Dragonflies will shortly appear in the Journal—the former by Dr. Gravely and the latter by Major Fraser, the two best authorities on the subject in the country. The editors of the journal are doing all they can to make their publications interesting to those of their readers to whom a recondite scientific article is somewhat terrifying. At the same time the scientific aspect of our publications must be preserved. The accumulation of knowledge by the scientific worker, who places the results of his researches, in whatever seemingly unimportant sphere of study he may be engaged, within the reach of those that come after him, is helping towards the progress of knowledge and those conversant with that progress are aware that at any time some apparently insignificant discovery has thrown such a flood of light upon certain phenomena as to directly benefit the whole progress of our race.

The Society is striving to meet the wishes of all its members, novices as well as experts, and the editors will always be glad to receive from their readers any suggestion whereby this publication may be improved or in any way tend to become of greater benefit to those to whom it appeals.

Our readers are aware that this Society is almost entirely maintained out of member's subscriptions and if the high standard of its publications is to be continued the source of its income must remain unimpaired. The recent unavoidable increase in subscriptions has been to some extent discounted by a corresponding loss of membership, and the editors hope that members will do all they can to help the Society by making its work and the advantage it offers, more widely known to their friends. A strong membership roll with constant additions to its numbers means to an amateur Society such as ours an increased vitality and a continuity of progress in the many spheres of its activity.

MISCELLANEOUS NOTES.

No. 1.—EDITORS' AND READERS' COMMENTS ON ARTICLES AND NOTES WHICH HAVE APPEARED IN PREVIOUS NUMBERS.

The Tsaine (*Bos banteng*).

(*Vol. XXVIII, No. 2. Misc. Note No.* 6.)

In his Catalogue of Ungulate Mammals Lydekker recognises 5 races of the Banting or Tsaine (*Bos banteng*) (*Bos sondaicus* of Blanford).

The range of the animal is given as "Java, Borneo, probably Sumatra, Bali; apparently a portion of the Malay Peninsula, Burma as far as the north of Pegu and Arrakan and thence through the hills of Chittagong to Manipur, Siam and Cochin China."

The typical race (*Bos banteng banteng*) is from Java. Lydekker describes the colour of the adult bull as blackish brown to black, with face similar to the back, and the white rump patch very large and contrasting strongly with the dark area. The Bornean Banting (*B. banteng lowi*) is said to be more or less identical in colour with the Javan form.

Lydekker distinguishes the Northern races from the two above described mainly by the white rump patch which is very much more developed in the Javan and Bornean races and by the colour of the adult bulls.

In the Burmese Banting or Tsaine (*B. banteng birmanicus*) the colour of the old bull is given as "dark tawny or chestnut appearing darker in some lights than in others and shading to light brown below. Very old bulls apparently become darker". The white rump patch is described as covering a smaller area than in the Javan and Bornean races being confined to the hind surface of the buttocks and thighs.

In the Siamese race (*B. banteng porteri*) (described from two fragmentary specimens) the colour is stated to be brown, flecked with white in contradistinction to the Burmese in which the body colour is said to be uniform.

The Malayan Banting (*B. b. butleri*) is considered in all probability to be a feral race of the domesticated Bali Banting (which is largely imported into Singapore). The bulls are described as 'blackish'.

The last race mentioned by Lydekker to which no sub specific has been attached is from Cochin China.

An interesting commentary on the above might be obtained from Major (now Col.) J. P. Evans' notes on the Tsaine in his book on Big Game shooting in Upper Burma (1911) in which Col. Evans goes somewhat into detail in reference to the colouring of the Tsaine; also from a letter received from Major Stockley on the subject. Commenting on the "white rump patch" which Lydekker cites as a point of difference between the Southern and Northern races of Banting. Major Stockley writes:—

"Lydekker states that the rump patch is more developed in the Burmese, Siamese and Malayan races than in the Javan and Bornean. I am quite sure that individual variation is great in this respect and would like to know how much material he had on which to base this differentiation. I also strongly suspect that the area of white on the buttocks and thighs decreases with age, as I have twice noticed young bulls with the white area extending nearly all over the thighs: so much so that in one case, in which the bull was grazing tail on to me, I at first took him to be an animal of some new species."

As regards the colour of the body, Col. Evans, who has had considerable opportunities of observing the Burmese Banting in a wild state, is of opinion that the cows and young bulls are of a bright chestnut with a white face, white stockings and a white patch on the buttocks. "Young bulls have practically the same colour as the cows but *often have white spots in the flanks* which in

course of time merge into each other and turn a dirty grey." Is it not probable that the white flecked colouring described by Lydekker as distinctive of the Siamese race (*B.b. porteri*) is merely the colouring of an immature animal. Writing of the Siamese race Major Stockley says :—

"As for *Bos banteng porteri*, I consider the subspecific quite unwarranted. The type specimen of *B.b. porteri* was shot by Mr. Porter on ground where several other tsaine had been shot previously, none of which had been spotted, or noted as such. I saw a photo of the specimen which was shown me by Mr. K. G. Gardiner, a keen and competent naturalist who has lived in Siam for nearly twenty years, and who doubted the validity of the race. The photo was published in the journal of the Natural History Society of Siam and showed a spotted bull with a poor head, which I would say was not quite mature, and certainly did not look to be an old animal. The spots were distributed fairly thickly over the shoulders and decreased in frequency towards the rear. The second specimen of *B.b. porteri* was shot by Mr. C. Yates at the end of March 1917, and was one of the three shot by him in that month on the same ground. Mr. Elwes was with him all the time, and himself shot a bull tsaine. Neither Mr. Elwes' bull or Mr. Yates' other two were spotted, nor were any of the bulls which Mr. Elwes had shot on the ground in previous years. It is improbable in the extreme that there could be two races of tsaine living in continuous areas of which specimens occasionally invade each other's territory. I may say that I have photos of two buck Barking Deer (*Cervulus muntiacus grandicornis*) shot in the Yamethin district of Burma in the same week on the same ground : one of them has two parallel rows of white spots on its sides, the other is quite unspotted. Will any sane person maintain that they are of different races ?"

Mature bulls according to Evans are usually yellowish brown, sometimes turning to dark grey colour on the sides and flanks. Old bulls usually have the face down to the muzzle a dirty white approaching to grey. They may be entirely grey (grey bulls according to Evans always possess magnificent heads) or the prevailing colour may be dull yellowish red (the shade of a withered leaf, or the red of old brown canvas) occasionally the colour is almost dark chocolate and rarely black (*the normal colour of the Javan race.*)

Thus we find in the males of the Burmese Banting a range of colour extending in the immature animals from bright chestnut, chestnut flecked with white to yellowish brown mixed with grey and in the older animals ranging from uniform grey to red, chocolate and black. Evans states that ordinarily in Burma the older the bull the lighter he is while Lydekker is of opinion that "very old bulls apparently become darker." Major Stockley is in agreement with Col. Evans. He writes :—

"I differ altogether from Lydekker when he states that the colour of old bulls goes darker with age. The khaki coloured bulls, I am sure, do nothing of the sort. As I have said in my original notes, I think it possible that the grey and copper-beech bulls possibly become buffalo-blue and chocolate, respectively, eventually, in some cases, going quite black ; but this is merely a suggestion, and not even my opinion, as I think the matter is quite uncertain."

The question arises in the absence of complete data and material as to how far the colouration of the Banting can be made the basis for distinguishing the various races of animal. What exactly are the features or characteristics by which the various races can be recognised, as tending to become permanent forms inhabiting a definite area ?

I think that a perusal of Major Stockley's and Col. Evans' notes will show how entirely unreliable colour is as a basis for determining the races of *Bos banteng*.

Distinctions based on scanty museum material are not in many instances borne out by the subsequent observation of field Naturalists and it would be better if decisions of this nature are deferred until sufficient material and data were forthcoming. Major Stockley writes :—

"I have protested before in the Society's journal against hasty differentiation of subspecies based on insufficient data (*vide* my notes on the horns of the Thamin) and I think that 'Wait and see' is the motto to adopt in the case of the Tsaine in this respect."

"Recent correspondence in the 'Field' has shown what a terrible muddle has been made of the Waterbucks and Kobs through Museum workers rushing to append new names to specimens with insufficient material to work on, with the result that now the genera and species are so mixed, that it is difficult to say what is a Kob and what a Waterbuck. Museum workers who do this sort of thing, put themselves in the position of staff officers who issue orders without reference to the information received from the front line, or who make no attempt to obtain such information: the result in each case is the same—chaos."

The dependence of the Museum worker on the Field Naturalist is here definitely expressed. He relies on the field observer not only for material but also for information as regards the conditions under which the species he is examining lives and has its being; including data as regards the time when the particular specimen was obtained, the locality, the altitude, and whether any variations in colour have been observed due to sex, age or season in any given district. Col. Evans and Major Stockley's notes on the Tsaine can be cited as an instance how far intelligent observation can go towards assisting in this direction.

S. H. Prater, C. M. Z. S.

Bombay Natural History Society.

Power of Scent in Wild Animals.

(*Misc. Note No.* 1, *Vol. XXVIII, No.* 1.)

Major W. M. Logan Home writes:—I have read Mr. Copley's notes on "The Power of Scent in Wild Animals", in Vol. XXVIII, No. 1, with interest.

I think however most sportsmen who have done much stalking in the Himalayas will agree with me that Mr. Copley's observations on lack of power of scent in wild animals do not in the least apply to Himalayan Game.

It is well known, for instance, that bears have most remarkable powers of scent: I have known a brown bear scent me 1,400 yards off, and I have had many stalks after black bears spoilt by their getting our wind.

The same applies to Ibex and Markhor. I remember on one occasion, my shikari and I were sitting in full view of a small herd of Ibex, which were about 25 yards off and feeding past us; although several of them looked straight at us, they continued feeding until they had got round to our wind side when they suddenly snorted and rushed off downhill and I can remember many other instances of the same sort where we eluded detection by sitting motionless against rocks or trees until the beasts worked round into the wind.

I remember losing the biggest Ibex I ever saw by neglecting to properly test the wind and as the incident might be of interest I give it below:—

My shikari and I and a local Balti cooly had been lying all day on the top of a ridge watching the Ibex, 4 fine old males, and one a very big head, where shown 400 yards below us. The wind where we lay blew straight up towards us from below *from both sides* and along up the ridge.

At about 4 p.m. I told the cooly to go back to camp the path led past the position of the Ibex but was hidden from view of the animals as it lay on the opposite side of the ridge. When he reached a point to the windward of the Ibex they suddenly got to their feet and rushed madly down in a direction away from the cooly halting after going about 200 yards and gazing back in the direction from which they came.

I realised then, to my disgust, that an eddy of wind had come round the ridge and carried the cooly's scent to the Ibex. The latter made off right across the valley and I saw them no more. The cooly was in my view all the time and was

quite hidden behind the ridge. Col. Kennion in his fascinating book, "Sport and Life in the further Himalaya," relates a similar incident where the changing of the wind in the middle of the stalk lost him a big head.

Comparison of Tiger and Panther Skulls.

(*Vol. XXVII, No. 4, Misc. Note No. 2.*)

Mrs. Maxwell writes :—

"It may be of interest in connection with the photographs of skulls in the journal of 31st July 1921, page 934, to see a photograph of two tiger skulls, the occipital condyles of which rest on the surface of the table, and to know that four out of eight tiger skulls in our possession have the occipital condyles in contact with the table."

We have examined a series of 24 tiger skulls in the Society's collection and find that in 7 skulls the occipital condyles were in contact with the surface on which they were resting. The remainder were raised above. It would appear from this, that, as a point of difference between Tiger and Panther skulls, Blanford's test would be of little value, since the above mentioned character is to be observed in the skulls of both animals, though possibly to a less extent in the Tiger.

B. C. Ellison, C.M.Z.S.

Panthers and Artificial Light.

(*Vol. XXVIII, No. 1, Misc. Note No. 2.*)

Mr. R. C. Morris writes :—With reference to the note under the above heading written by Mr. C. B. Beadnell, the following account should be of interest:

In February 1921, my wife and I were sitting up over a "kill" in a shola. Soon after dark I decided to test the electric light apparatus and found that it was not working. There was no time or light to see what was wrong, and whistling for our sholaga shikaris, I instructed them to tie up a hurricane lamp over the kill. While they were doing so the panther came to the edge of the cleared patch round the kill and slunk back into the shola on seeing the men. I had to call out to the men, who had not seen the panther, to clear out. A few minutes later the panther walked out into the full light of the lantern and started his meal and paid the penalty for his daring. Another panther was killed, and yet another was missed, in lantern light last year on these hills and I know of no other instances.

An instance of the extraordinary cunning of panthers is shown by the following incident :—

Recently my wife's favourite dog was killed by a panther and we sat up over the kill until it began to rain, when we decided to return to our bungalow. My wife did not like the idea of the panther turning up and devouring the dog's remains in our absence and so we had the carcase put up on the machan. On our visiting the spot the next morning we were astonished to find that the panther had climbed up on to the machan and had devoured the remains of the dog. The machan was a considerable height off the ground.

Living a life in the jungle one sees or comes across many strange and exciting jungle incidents and tragedies. Perhaps the most extraordinary sight that I have ever witnessed was the killing of a solitary bull bison by a solitary elephant.

Bird Collectors in India.

(*Editorial, Vol. XXVIII, No.* 1.)

Dr. C. B. Ticehurst writes :—

With reference to the letter of Capt. Livesey quoted in your last editorial, and your remarks on his impossible scheme, I should like to say a few words. The impression given is that India is swarming with bird collectors, out to get any rare and beautiful plumaged bird they see. Broadly speaking, of course, there is no such thing as a rare bird, all being as common as Nature intended them to be, if looked for in their true habitation, that, however, is by the way. But where are all these collectors Capt. Livesey complains about ? I should be glad to know as with so much yet remaining to do in India they should be encouraged. When I was in Sind I knew of *three* (besides myself) all doing valuable work in parts little or not known, there may have been others I did not hear of, if so, they remain silent judging by the papers which have in the last few years appeared in the Journal. But since I left India, it appears, collectors have greatly increased in number, I rejoice to hear it, as doubtless now there will be no difficulty in obtaining *desiderata* which we in England are handicapped for the lack of ! If Capt. Livesey will give us a list of collectors and their districts we can then inform them through the Journal what specimens are required thence for the British Museum, and the Curator of our Society could add *his desiderata*.

Now as to his scheme, in the first place the Society surely has no power to prohibit " the slaughter of rare and beautiful birds." This can only be done by an Act and the " Prohibition of Export of Plumes Act " gives protection against slaughter for trade purposes. Without a very wide and very special knowledge of the whole of the birds of India, which no single man possesses, no one can lay down the law as to what should be the limits in collecting. Capt. Livesey suggests a typical series of skins of each species by which of course he must mean a series from the type locality, a very desirable object which neither the Bombay nor British Museum has attained as yet for every Indian *species* even. And what of races ? Still less are these collections representative.

To avoid collecting birds on the fringe of their distribution pre-supposes a pretty exact knowledge of the range of every species and race in India, and entails far more collecting yet ; the results when obtained would take the most skilled worker years to work out. No ! In my opinion Capt. Livesey has started at the wrong end and the required knowledge for his diagrams does not exist. As regards publication of diagrams, 12-15 quarterly, by the Society giving such information as we possess up to date of geographical distribution, is it suggested that each Indian species should be put on one of these ? That is taking the number as in the Fauna as 1617 (and it is many more now), is the work to be spread over 27 years, and who is to prepare this almost life's work ?

There is one suggestion, however, which I can find myself in agreement with and that is the publication of a list of " wants ". I should not bother about " do not wants " as no well made skin with full data of practically any Indian bird from anywhere would ever figure among the " do not wants " at any Museum ; I should confine " do not wants " to scraps without data. I began a list of " wants " last year with an appeal for nestlings of any Indian birds, a subject on which we know *nothing* (see B. N. H. S. J., XXVII, p. 931), an investigation any egg collector in India (and in my day they far out-numbered skin collectors) could help with, but up to date as a result I have received *one* specimen.

I, and no doubt others, who work at the British Museum would send along lists of " wants " for various localities if there was any chance that the wants would be supplied. For example, certain birds are wanted, all common enough, from some locality between Benares and the Vindhya Hills—say the area, Sangor-Jubbulpore-Ramnagar—as it was from this area Franklin described a good many

birds, but even to this day specimens thence are very poorly represented in the British Museum. If any response is forthcoming I shall be pleased to supply the names of the actual species. Collecting without method provided birds are collected properly is not a waste of time or bird life, though I quite grant more could be done if collectors knew what was particularly wanted in their area, but they must make themselves known first.

Birds of Mesopotamia.

(*Vol. XXVIII, No.* 1, *page* 222).

In Dr. Ticehurst's "Birds of Mesopotamia" published in your last issue. he omits perhaps the one and only interesting fact in the nidification of the Hooded crow (*Corvus cornix*) in Mesopotamia, which is, that in the absence of date palms it will nest in the dense reed beds (Hamar Lake).

Kotah, Rajaputana, T. R. Livesey, Capt.
25*th February* 1922.

Notes on Lizards, Frogs and Human Beings in the Nilgiri District.

(*Vol. XXVIII, No.* 2, *page* 493.)

A parallel to Col. Wall's interesting researches into the habits of Reptiles and Amphibians in the Nilgiris published in Vol. XXVIII, No. 2, of the Society's journal may be found in an interesting article published in the September issue of the Magazine of Natural History (Journal of the American Museum of Natural History). Mr. Kingsley Noble, Curator of Reptiles in the American Museum of Natural History, recounts the methods employed by him in his attempts to discover the life histories and habits of the reptiles and amphibians, especially the remarkable frogs of the Andean region. The most interesting of these is the Marsupial Frog the female of which is provided with a pouch in which she carries the eggs until well developed. In the pouch the young are reared until an advanced stage in the tadpole existence. Many interesting details in the life history of this Frog remain unsolved. Little is known about its habits, its pouch, its egg laying and the manner in which the egg reaches the pouch which, by the way, is situated on the frog's back. It was towards helping to solve some of these problems that Mr. Noble particularly directed his efforts. Col. Wall spent much time and patience in discovering that, the little "castanet" Frogs were the authors of the "Clap like sounds", which every visitor to the Nilgiris during the rains is familiar with. Mr. Noble's methods may therefore commend themselves to the gallant Colonel or anyone desirous of following in his footsteps. Mr. Noble writes: "There is only one way of delving into the home life of a frog, *i.e.*, to steal upon him at night when his amorous calling betrays his place of hiding. With an electric flash light the task is easy for the frog seems to be as little concerned over one's presence as he is over the fire flies which flit across his world. His callings, love making, nest building, may be examined in as great detail in the open as in his structure in the laboratory. It was obvious that if we were to investigate the marsupial frog into revealing any of his great secrets it would have to be done at night." Recounting his experiences Mr. Noble writes:—

"I started off alone toward a bannana patch where I had heard the previous evening the hammering of a dozen carpenters. There was something about the quality of the hammering which told me the 'Carpenters'

were not human. I thought of the carpenter frogs which come to our Jersey pine barrens in the spring. These are of a different family and their hammering has a clattering, less deliberate ring. The New Jersey 'Carpenters' always sound to me like a crowd of boys laying shingles, while the clear measured clap of these hammers could be compared only with that of a skilled workman.

First I followed an old agave-grown wall, then another stone wall running to the bannana field. It was a different world at night. My light fell first upon a giant centipede, more than eight inches in length, putting into service every one of its many legs for a rapid escape up the trail. Numerous jewels shone on the periphery of the light. Some of these on investigation proved to be nothing but drops of water, others of a deeper glow were the eyes of spiders. A little farther on a glimpse of two close-set headlights, followed by a creature's wild rush through a thicket, told me that I had disturbed an opossum in its nocturnal wanderings.

The hammering became much louder as I approached the bannana patch. I realized that the hammerers were not all in the bannana plants; some were in the old stone wall, and others in the agave plants. I started toward one of the performers, but another calling nearer at hand turned me aside, and before I had fairly well started, it seemed much easier to run down a third. It was only after I had concentrated my entire attention on the pounding of one of these Huancabamba 'Carpenters' that I had any success at all, and then it seemed so easy. The performers were not the least disconcerted by the spot light."

No. II.—JUNGLE NOTES.

The Tiger making the "Sambhar Call."

Mr. Hugh Copley writes to us on the above subject as follows:—

"When away on Christmas Camp and enjoying the blaze of a jolly fire we heard the call of a sambhar which every night came to drink below us within half a mile followed by the tiger 'sambhar' call if I might call it so. The sambhar and the tiger called after each other for ten minutes during which time we had called up two Bigas who confirmed each call as it was made.

Now the call although alike (and would be sworn to as alike by the average man) is not so by any means. Firstly the sambhar call is higher in pitch, more musical and also shorter and finishes clear. The tiger 'sambhar' call is lower, more chesty, and not clear cut. This call given by itself might easily be mistaken but the two calling together educated the listener to the difference very quickly.

It is known and proved by experiments that the ear drum of man has by evolution changed considerably since the time we were cave men, and is rapidly (used in its correct sense with reference to evolution) changing to receive wave lengths of much shorter length, such as the noises of civilisation heard towns, so that we cannot, as we once did, receive and interpret lower or longer wave lengths. You have only to see bush tribes (hunters) in Central Africa at work, to realise how they receive and interpret lower wave lengths. Now the same thing occurs in a much greater degree with animals and I doubt very much if any animal mistakes the sambhar call for that of the tiger 'sambhar' call. Therefore this call is not used by the tiger with any idea of luring the poor unsuspecting sambhar to his doom. Secondly it would be a cute animal to lure a C.P. sambhar to any doom. This view is also held by theBigas.

It therefore must I think be a mate call but this will be a very difficult thing to find out."

Mr. Dunbar Brander writing to us in regard to this says :—

"The tiger's noise is a mate call pure and simple, although very like a low sambhar bell no sambhar would mistake it. I have had a tiger make it at me when I walked him off his kill in long grass and he thought I was his mate."

Major C. H. Stockley gives us the following experience :—

"Walking along a forest track in upper Burma in July 1914 about 11 a.m. I came to a small tract of open tree and grass jungle bordering a deep ravine into which several small gullies ran from my direction. From the direction of the ravine I heard what I took to be a sambhar call, when I was only 40 yards from it. I walked towards it hoping to see a stag, when suddenly the call came from a small gully 15 yards away. I could not see the bottom but it looked much too small to hold a sambhar. I moved cautiously forward and found it was only three feet deep with a sandy bottom in which were the pug marks of a large tiger : the sand was still running down into them. I followed them to the main ravine and found the tiger had then gallopped off along the bottom. I surmise that he had heard me coming along the track, called, and then sneaked up the gully towards me thinking it was game (a cow tsaine perhaps) approaching, discovered his mistake and bolted. The call was quite possibly to attract his mate."

Lt.-Col. R. W. Burton *in epistola* says on this subject :—

"That tigers make a 'Sambhar-like-call' has been noticed in the Journal of the Society (Vol. XXI, page 235) by writers from both India and Burma. *Vide* Vol. XXI, page 235, where Major H. H. Harington writes that it is a well known fact in Burma that tigers often 'call' like a sambhar and he gives an experience of his own. Mr. J. W. Best also relates an occasion on which in the Central Provinces of India he actually saw a *tigress* making a noise which he at first thought to come from a sambhar. Mr. Copley now writing from the Central Provinces describes the 'call' and gives an interesting description of it as compared with that of the sambhar, both being heard at the same time, and thinks it must be a 'mate' call.

I have on two occasions heard tigers make the 'Sambhar-like-call' (1912 Eastern Ghats) and agree with Mr. Copley that the call would not, probably, deceive an animal. No doubt the denizens of the jungle very readily recognise it for the imitation that it is : but Mr. Copley's conjecture as to its being a 'mate' call is not borne out by the circumstances related by the two writers previously quoted. So far as I know there was no tiger any where near when I heard the 'call' which was several times repeated and it seemed to be a 'hunting' note : perhaps tigers think themselves to be better mimics than they are.

It may be that animal curiosity causes sambhar to tarry in the vicinity and so enable the questing tiger, having 'called' in one direction, to slip round and gain a nearer approach.

It is not difficult to call up 'Kakur' (Muntjac) by means of a blade of grass or a leaf placed between the thumbs and blown upon edgeways. Moose are 'called up' as is well known. Certain tribes in India— snarers of animals—can call up jackals to within a few yards. Such incidents can be added to from many parts of the world, so why should not the tiger have acquired the habit of calling up a prospective dinner or at least inducing it to stay a while from headlong flight.

Probably sportsmen with wider experience than mine may be able to offer more definite information. It is curious that Mr. Inverarity and Mr. Reginald Gilbert, have made no mention of this habit in their various exhaustive articles in our journal: neither so far as I can call to mind have any other writers."

The papers by Mr. Inverarity and the late Mr. Reginald Gilbert which Col. Burton refers to are evidently the following:—Sambhar and Sambhar Stalking by J. D. Inverarity, Vol. VIII, p. 391, and an article with the same title by Reginald Gilbert published in Vol. III, p. 224. We give particulars of the journal in which they appeared as some members who do not possess the earlier numbers of the journal might like to obtain them.

Sambhar Swinging by their Horns.

In regard to this Mr. Copley writes:—

"Not long ago I was watching a fine Cheetal Stag with attendant ladies grazing under a 'ber' tree which at this time of the year has a plum like fruit. This was as usual a pretty jungle scene, but what particularly interested me was the fact that several times the stag got up on his hind legs and swept his horns through the branches of the 'ber' tree knocking the fruit to ground. Then quite bucked with the performance he ate, but would not allow the does to do so. Does this bear on the above question? Might a sambhar also brushing off 'ber' fruit get caught like Absalom? I cannot think that pleasure is expressed by males more than females. My experience is (certainly when watched, in big herds) that the females are always up to pleasure, generally being very skittish, and female sambhar who are apt to play much more than their lords and masters cannot try swinging for pleasure so why should the stags? So if the kind gentleman who next finds the swinging places of sambhar stags will kindly tell us the name of the tree, heights, etc., we shall be much more nearer the truth."

Mr. Dunbar Brander comments as follows:—

"The sambhar stands right up on his hind legs during the rut and remains so quite a time. In doing so he not infrequently gets his horns over an overhanging branch; the tree may be of any species—he is not after food."

Lt.-Col. Burton in his letter quoted before writes:—

"The legend of sambhar swinging by their horns as a pastime has not come to my notice either among the Marias or other jungle people with whom I am acquainted."

Duck and Snipe in the Central Provinces.

Can any of our members in the Central Provinces answer the following question by Mr. Copley?

"Where are the duck and snipe this year in the Central Provinces? From all the different districts I have had no news, neither have I seen them myself. North, East, West and South they are absent, even in places which unlike this blessed place, have full tanks and have had plentiful rain during the season."

Will members of the Society, wherever they may be stationed, send us copies of their Game books for the past season? In Mr. Kinnear's days we tried to collect such information and though we had fewer replies than we anticipated, the replies received were of considerable use to Mr. Stuart Baker and the authorities at the British Museum. For the majority of our members such reports. elaborated a little with personal notes on the shoots recorded, will be of considerable interest. We do not ask our correspondents to give away their favourite shooting grounds, the district is all that is necessary for record purposes.

A summarised account of the cold weather season 1921-22 shooting in India and Burma, if only the response to this appeal will make it comprehensive enough, will be of benefit to members and perhaps be the means of increasing the membership of the Society. We ought to have far more members than we have but we fear some consider the journal "too scientific". There should be no reproach in our journal being scientific. It is the scientific papers which have made and do make it so valuable but in view of papers such as the above, the article on 'Butterfly collecting in India' by Col. Evans, Major Stockley's papers, and so many others, is there not sufficient matter of interest for the most unscientific "shikari ?"

No. III.—THE INDIAN LION.

A few months ago a lion was shot in the main street of the small and semi-deserted village of Shergarh in Kotah State. I have been able to obtain possession of the skin—or the remains of the skin—which I am sending to the Society as a donation from the Maharaj Kumar Saheb of Kotah. A lioness is reported to have been seen in the same vicinity. Rumours of a lion having been seen at Sawai Mahdopur, just north of this State, were current about a year ago.

With regard to this skin, I have endeavoured to discover—in vain—where this lion came from. It is said that the lions liberated in Gwalior some years ago were all accounted for, though it would be as well to get this confirmed or contradicted.

The only other lions I have heard of were a pair liberated in Bundi some 10-15 years ago. According to some accounts both these beasts (which are said to have come originally from Kotah) were shortly afterwards found dead ; according to others they were not seen again. It is just possible that they bred. Perhaps some member of the Society will be able to supply some information which will help to clear up this somewhat mysterious occurrence of a lion in Rajputana.

That lions were abundant here in the old days would seem apparent, for they are frequently depicted in the stirring shikar scenes which decorate the old Palaces, taking precedence as Royal game, over even the tiger.

In conclusion I may say that the skin is a small one—apparently a male lion 2 or 3 years old. We are trying to obtain the skull but it has probably been broken up and disposed of.

T. R. LIVESEY.

KOTAH, *March 21st*, 1922.

No. IV—THE OCCURRENCE OF THE STRIPE-BACKED WEASEL (*MUSTELA STRIGIDORSA*) IN THE NAGA HILLS.

I write to report the occurrence in this district of *Mustela strigidorsa*, which as far as the authorities to which I have access go, has hitherto only been reported from the Himalayas. I was driving in a motor car in this district at a height of about 5,000 feet when the car had to be stopped to avoid running over two small animals fighting in the middle of the road. In spite of the fact that they were almost touched by the front wheel of a very ramshackle and noisy Ford, they continued fighting within a foot of the car, and the battle progressed for some minutes alongside the foot-board and eventually worked across the road into the gutter on the far side, when I got out to watch it at close quarters again. The bigger of the two was an enormous rat, probably a bandicoot or something

very like it, while the smaller, which could not have weighed more than a third of its antagonist, was a weasel. I was able to observe it very closely. The body was about 11 or 12 inches long and its tail 4 or 5. The hairs of the tail were bristling out at right angles to the bone, and were shorter towards the tip. The general colour was a deep ruddy brown, with hint of something almost purplish in it. The chest and throat appeared to be lighter and yellowish; there was no black tip to the tail; from the neck right down the back, nearly to the root of the tail, ran a narrow white line, so clearly marked as to appear artificial, as though put on with paint. The head was that of a typical weasel, with the eyes set very much on the surface and looking like protruding black beads. The weasel had the rat by the muzzle, holding on like a bull-terrier, and kept pulling him down, when the two would roll over until the rat managed to stagger to his feet again, when the process recommenced. The rat was obviously being worn out, as he was unable to run when the weasel let go (which he did not do till I was stooping over and almost touching him), while the weasel was able to run off exceedingly briskly. I have never seen this weasel before, and a Kuki who was with me said that it was unknown to him also, though he was a native of the district and an intelligent jungle man.

J. H. HUTTON.

KOHIMA, NAGA HILLS,
15*th January* 1922.

No. V—THE TENASSERIM TREE-SHREW (*TUPAIA BELANGERI*).

As this little beast is plentiful in the area I am working in and as hitherto tree-shrews have been looked upon by me, and I have no doubt the same applies to many of our members, as quaint rarities, I made it a point to try and learn something about it and I hope these notes may be of interest.

The first thing I noticed about this little animal was the fact that it must have been named "tree-shrew" by some learned naturalist when feeling in a sarcastic mood, as, though an inhabitant of heavy and medium forests, up a tree is the last place I should advise a collector to search for it. Having learnt a good deal about this animal I should advise any one finding a tree-shrew up a tree to treat it exactly as recommended in the case of weasles caught asleep. So far as I have been able to observe, the tree-shrew is wholly diurnal in its habits but, being a confirmed skulker and an exceedingly timid one at that, it is not as commonly seen as one would expect from the numbers caught in traps. Its movements remind one forcibly of the days when, due to ground being under enemy observation or to points where snipers sniped from, one moved in the same way. Sitting perfectly quiet in the jungle after an absolute silence of perhaps a minute or two, one hears a slight rustling coming from a dense patch of tangled creepers messed up with a large fallen branch on one's left. Very very gradually you turn your head towards the sound but, just as the spot comes into view, all sound ceases. You turned the least little bit too quick and have been spotted. You continue to stare hard at where you think the last sound came from but see no sign of animal life whatever and then a brilliant idea strikes you. "Confound it, it must have been one of those lizards that are always poking about under leaves" but just as you are thinking of taking a look up at the trees a "tch tch" comes from the old spot. More eye strain and once again no sound but, this time, you know that it is a bird, one of those wee ground babblers, and you are determined to spot it. Patiently you stare at the mass of creepers, working from right to left, from top to bottom and *vice versa* but no! not a living thing can you see bar red ants on that tendril, and if you can see them your sight cannot be so bad. You decide to rest your eyes for a few seconds and then to have another look so you take a glance up at

that creeper bedecked tree as being a likely place for a squirrel. Hardly have you focussed on the creepers when there is a scurry from the old spot and you are just in time to see something small and brown disappear into a patch of undergrowth some three or four yards to the right. Once again you freeze and stare but this time, just as your eyes are beginning to smart, there is a jump, jump, and you see something small and brown among leaves of the same colour, but it might be anything. Then once again there is the " tch tch " and a little brown beast starts to move, lifting each foot carefully and with its tail all of a bristle and " half cocked " if I may use such an expression. " Tch Tch Tch Tch " it calls and with each sound the tail gives a twitch. It has now reached the edge of the cover and is deciding whether the next cover can be reached in one or two short sharp rushes. Its mind made up, it streaks across the open in a series of rapid jumps. Not half away across it spots you and becomes suddenly motionless, all four feet together, back arched and tail inclined almost parallel to its back. Thus it remains for a few seconds, too terrified to think properly, then making up its mind to chance it, it dashes across the remaining distance to cover. Curiosity is said to have done down the cat but the tree-shrew, in common with all living creatures, has its full share and if you remain quiet you will see that this is so. There ! it jumped on to that creeper and is now behind that leaf. Another jump and it is in full view directly facing you. Its head now starts to bob up and down in a hawk-like fashion and its tail, all a bristle, twitches simultaneously. It has settled in its mind that you are only a stump so hops along among the creepers and is on to the ground again nosing among the fallen leaves for insects. It pauses a moment with head bowed and mouth open while with one paw it picks its teeth. While doing this one might almost imagine it a miniature mongoose, in fact in many of its movements there is something very mongoose-like. Just when you are getting really interested in watching the little nerve ridden beast a squirrel gives the warning " hawk over " and the tree-shrew darts back into cover again.

Though I never came across the young and am unable to give information as to the time of year in which they are born, I found that the adults were courting in January. During the period of courtship the tree-shrew is more in evidence though not, as I found, so often trapped. Love evidently abolishes hunger ! The males as far as I could judge positively refuse to take NO for an answer, though whether like some married men, they afterwards wish to goodness they had, I know not. I watched for a considerable time a couple chasing around and while the chase was in progress an occasional shrill twittering cry would come from them both, no doubt meaning something as different in each case as the sex which uttered it. Eventually (feeling no doubt exhausted) the female jumped into a creeper about two inches off the ground and turned facing the male. Though I was within a few feet of the pair I heard nothing beyond an occasional very low chortle but the tails of both kept up a continual twitching and doubtless that, and facial expression were ample language for the occasion. When the lady was rested she fled, screaming in the same shrill twitter " I loathe you, nothing will ever induce me to become your wife." " Consent is the least part of it " was the reply as her lover scampered after her and I thought at the time of an old song, in regard to a persistent lover, entitled " The villain still pursued her."

The tree-shrew is an exceedingly agile little beast and can, like a mongoose, jump with the same rapidity backwards, sideways or forward. Being very tenacious of life quite a number escape from the traps and the more badly injured ones may sometimes be found at a little distance from the traps still endeavouring to get away. I find that it is a good thing to look for blow-flies in a case where an animal has escaped as, if it is unable, as is often the case, to do more than crawl, these flies get busy on it and I think it is beyond doubt that where these flies are, something dead or smelly or both will be found.

Tree-shrews eat fruit picked up off the ground as well as insects, as an examination of their interior economy shows.

From the article which appeared in the last number I gather that Mr. Fitzpatrick is a keen collector of animal folklore stories and if he wishes to add to his collection I have the true story as to exactly how the tree-shrew came about and why he is, what he is, a little brown, furry, longnosed, nerve ridden beast. Unfortunately the Editors tell me it is too long for inclusion here.

MERGUI, C. PRIMROSE.

20*th March* 1922.

No. VI—FOUR-HORNED FAT-TAILED SHEEP.

Can anyone tell me whether they have seen alive or dead a fat-tailed sheep with four horns ? I came across a passage in a book called a Summer in High Asia (Thacker 1899) by Capt. Adair, late Rifle Brigade. He says on page 199 that he saw in the possession of two travellers (mentioned only as " P & C ") who had wintered in Yarkand and were bringing down some fine heads of *O. poli* from the Pamirs, where they had been deserted by their coolies in attempting to cross the Mustagh Pass, a four-horned sheep, one of the fat-tailed, from the Pamir. In addition to its ordinary ram's horns it had two horns rather like those of an Ibex, but straight and some 20 inches in length. It was quite tame and would eat from the hand. I possess the head of a four-horned ram from Kishtwar and have seen others from various parts of China but none of these were fat-tailed sheep and if such a thing now exists in any museum or collection I should be very glad to procure a photograph or measurements of it.

H. J. ELWES.

COLESBORNE, GLOS., ENGLAND.

7*th January* 1922.

No. VII.—DESTRUCTION OF BIRDS' NESTS.

We publish below a number of letters received in response to Mr. R. C. Bolster's appeal for information on the above subject:—

It is with interest that I have read Mr. Bolster's account of mysterious disappearance and destruction of nests. This must be very common in India and has been noted by several people. Colonel Butler in the seventies recorded that if a nest with eggs was left for future visit, they always in the interval disappeared. During 2½ years in Sind I only remember one nest which on being left came to anything, and that was a nest of the Indus Sand-Lark, which I spotted as I was riding across the Desert and looked at without dismounting. Every other nest disappeared, or at least, the eggs were taken ; I have even known a nest from which I had taken the eggs completely vanish.

I think that there are several causes, firstly in many places, unless very lonely spots, there is a native about, and his curiosity, natural at all times, is aroused by the (to him) strange behaviour of anyone interested in natural history, and one is constantly being watched; when the coast is clear, he goes to see what the *sahib* was doing and takes the eggs of larger birds for food, and smaller ones possibly, I fear, from spite.

Round Karachi I know crows and heron's eggs were always taken, but there are other enemies to small birds, and I think Mr. Bolster is quite correct in accusing lizards, but the worst thief of all is the House Crow. In the nesting season I always had a flock following me about all day in the cultivation and I am certain they watch one's doings with an eye, to future evil intent: so certain was I that they did this, that I have fooled them by being very interested in nothing

in a likely bush, and have afterwards seen them fly to the bush to investigate. Other enemies to ground birds are Kites and Desert Foxes. I have seen the foot-prints of Kites at a nest of Saunders' Tern, which the day previous held eggs, and I have found Fox " spoor " in amongst the colony after I had visited it, and, here again I was watched or more probably tracked by this very inquisitive little animal. Snakes too, may be guilty, but whether a nest is found or not there is a huge destruction by nature. One colony of Saunders' Terns owing to big tides and depredations of animals did not produce a single flying young, one year, and a colony of Sandgrouse, about 50 pairs, did not raise six young; think what it would be if every bird brought out a full brood every year and none died for ten years. For a lecture I once gave at Karachi, I calculated the effect in the case of the House Crow and I estimated that in this town, every available inch of space, houses, ground and trees in Karachi would be covered with birds, and above them a huge black pall of those which had no room to settle!

LOWESTOFT, ENGLAND,
18*th March* 1922.

CLAUD. B. TICEHURST, M.A., M.B.O.U.,
Late Capt., R. A. M. C.

In an article on ' Birds and their enemies ' in a recent issue of the "Pioneer" Mr. Dewar answers a question which is very often asked.

My experience added to this might serve to throw some light on Mr. Bolster's ' Destruction of Birds ' Nests ' which appeared in the last Volume XXVIII, No. 1 of your journal.

The hot weather is come and with it have returned a number of my feathered friends who spent the summer with me last year: the bulbul, the tailor-bird, the honeysucker and the brown munia are here again seeking to build nests, strange to say, about the same places where three out of the four pairs unsuccessfully kept house last year.

For years I had noticed the destruction of nests as described by Mr. Bolster, and only last year I discovered the cause. I watched a tailor bird build its nest in a vine which overhangs my study window and later I saw one of the birds sitting in the nest which I one day noticed contained three tiny eggs. Two or three days after I answered their calls of distress and arrived in time to drive off a tree pie which had torn one side of the nest and dislodged two of the young. With a needle and thread I repaired the nest and replaced the little ones which I was glad to see take wing a fortnight later.

On two other occasions the cries of the munias which had built in a creeping rose hard by my verandah steps, and of the bulbuls which had taken possession of an aralia in my verandah, brought me out; and on each occasion I saw the same bird rifle the nests.

The honeysucker's nest was destroyed in my absence but I have no doubt *Dendrocitta rufa* knew something about it.

Another thief is the Crow-pheasant or mokok (*Centropus sinensis*) I saw him carry off a dove's egg which he placed on my lawn and which I rescued before he had time to begin his meal. But it was no use, he had dented the egg in the act of carrying it.

I had often noticed the mutri and the mokok hopping through the whole length of a hedge row and only last year discovered what their object was.

Yes, garden lizards are responsible, not for the destruction but for the rifling of many a little bird's nest. In the one instance which came under my observation the eggs were eaten in the nest and the shells left. I saw the lizard leave the nest.

LUCKNOW,
27*th March* 1922.

T. DE GREYTHER.

Having read Mr. R. C. Bolster's note on the above subject. I am tempted to send observations made by me from time to time which I hope will be of some interest.

During the months of May and June 1918, having time to spare, I gave a good deal of it to searching for nests with the view to finding out what is roughly the percentage of success in birds bringing out their young. The difficulties were far greater than I had expected but I give in the following list the results. The nests were visited by me frequently, but not daily and I always went unaccompanied, so that no human being knew of these nests, so far as I am aware.

From the tables on the adjoining pages will be seen that 27 birds laid 77 eggs ; hatched 39 young, but only succeeded in taking out 26. The percentage of success is roughly 33 per cent. The members of the genus *Lanius* were most successful and reared all their young. This no doubt is due to their pluck in keeping off despoilers. Only in two cases were the robbers actually caught in the act and in both instances they were Jungle crows (*C. macrorhynchus*), but I would not place all thefts to their account. The greatest sinner in this respect is *Dendrocitta rufa* (Scop). (The Indian Tree Pie) and the destruction caused by this bird is appalling.

I have noticed these birds for several years now and only wonder that any nests of the small birds escape destruction. Whether they feed their young on the eggs and young of other birds while they are nestlings I cannot say, but they certainly do so after the brood is able to fly. For the past few years a pair of *D. rufa* have visited this place accompanied by their brood, from two to four almost full grown youngsters, and have made a systematic search of all the trees and bushes in my garden. It is generally in early July that they come, and it is also just about the time when most birds have eggs or young. During these visits I have always found that all the nests have been cleared out, and no matter how well a nest may have been placed, it never escaped destruction.

During August 1919 I had over a dozen nests of Weaver Birds (*Ploceus baya*) (Blyth) under observation. These nests were hung from some thorny bushes a few feet from the ground. I visited these daily and on 14th August noticed that some had young, as the parent birds were busy feeding them. The next day on my arrival I found the whole family of *D. rufa* (two parent birds and three young) engaged at the nests and were just finishing their work of destruction. They had torn a hole in each nest sufficiently large to admit their heads just at the spot where the nest bulges and had extracted and devoured the contents. I have little doubt that the monitor lizard (*V. bengalensis*) referred to by Mr. Bolster does a great deal of mischief, but I have only once seen him swallow the unfledged young of a Sun bird (*Arachnecthra*). The nest was hanging from a creeper just outside my window and on noticing that the birds were alarmed I looked out and saw him with one in his mouth which he proceeded to swallow alive. I hastened to the nest but was too late as the young had all gone.

Name of Bird.	Date.	Position of Nest.	Clutch.	Hatched or not.	Remarks.
1. *Arachnecthra asiatica* (Lath), Purple Sun Bird.	12–5–18	3 ft. from ground in a rose bush.	2 eggs.	No.	1 egg found in nest on 20th, none on 26th.
2. *Terpsiphone paradisi* (L.), Paradise Flycatcher.	12–5–18	5 ft. from ground in a Lichi tree.	4 eggs.	No.	Nest empty on 13th. Saw a crow leave the tree.
3. *Arachnecthra asiatica* (Lath)	14–5–18	5 ft. from ground in a creeping rose.	3 eggs.	No.	Nest destroyed on 27th. Not known how.
4. *Terpsiphone paradisi* (L.) ..	14–5–18	20 ft. from ground on a Tun tree.	3 eggs.	Yes, 2 young.	Nest found destroyed on 30-5-18.
5. *Zosterops palpebrosa* (Temm.), Indian White-eye.	17–5–18	4 ft. from ground on a Lichi tree.	3 eggs.	Yes, 3 young on 19–5–18	Nest found empty on 21-5-18.
6. „ „ „	18–5–18	8 ft. from ground on a Plum tree.	3 young, a few days old.		Nest found empty on 19-5-18.
7. *Terpsiphone paradisi* (L.) ..	20–5–18	15 ft. from ground on a Mango tree.	4 eggs.	Yes, 3 young.	Took out all three which kept near the nest for a few days.
8. *Dicrurus ater* (Herm.) Black Drongo.	21–5–18	20 ft. from ground on a Tun tree.	3 spotted eggs	Yes, one young 28–5–18	Took out one and this a cuckoo.
9. *Lanius erythronotus* (Vig). Rufous-backed Shrike.	22–5–18	12 ft. from ground on a Mango tree.	6 eggs.	6 young on 24–5–18	Took out all six. Were seen near the nest for two days

Name of Bird.	Date.	Position of Nest.	Clutch.	Hatched or not.	Remarks.
10. *Zosterops palpebrosa* (Temm.)	22–5–18	6 ft. from ground in a creeper.	3 eggs.	No.	One egg only on 27–5–18. Nest destroyed on 3-6-18.
11. *Acridotheres tristis* (L.) Common Myna.	23–5–18	12 ft. from ground, in the crown of a Date palm.	Not known.	No.	Nest destroyed by crows and the eggs carried off in my presence.
12. *Zosterops palpebrosa* (Temm.).	23–5–18	13 ft. from ground on a *G. robusta* tree.	3 eggs.	No.	Nest destroyed.
13. *Oriolus kundoo* (Sykes), Indian Oriole.	24–5–18	16 ft. from ground on a Mango tree.	3 eggs.	Yes, 3 young on 31–5–18	Young taken by crows on 7–6–18.
14. *Copsychus saularis* (L.), Magpie-Robin.	24–5–18	12 ft. from ground on a beam under the eave of my house.	2 eggs.	No.	Birds driven off by a pair of Mynas, *A. tristis*.
15. *Lanius vittatus* (Val), Bay-backed Shripe.	27–5–18	7 ft. from ground on a Mango tree.	2 eggs.	Yes, 2 young.	Took out both.
16. *Molpastes intermedius* (Hay) Punjab Red-vented Bulbul.	4–6–18	7 ft. from ground in a Plum tree.	2 eggs.	2 young on 12-6-18	Took out both.
17. „ „ „	13–6–18	9 ft. from ground in a bunch of Plantain fruit.	....	....	Nest deserted on 17-6-18.
18. *Lanius erythronotus* (Vig.)	16–6–18	15 ft. from ground on a Mango tree.	5 eggs.	Yes, 5 young.	Took out all five.
19. „ „ „ ..	25–6–18	10 ft. from ground on a Mango tree	2 young found.	....	Uncertain as to whether they succeeded in taking young out.

Name of Bird.	Date.	Position of Nest.	Clutch.	Hatched or not.	Remarks.
20. *Pyctorhis sinensis* (Gm.), Yellow-eyed Babbler.	16–6–18	5 ft. from ground in a bush.	3 eggs.	No.	Eggs destroyed on 21-6-18.
21. *Zosterops palpebrosa* (Temm.)	23–6–18	2½ ft. from ground in a Lime tree.	3 eggs.	Yes, 3 young.	Took out all three.
22. *Dicrurus ater* (Herm.)	1–7–18	25 ft. from ground on a Mango tree.	1 young found.	Yes.	Took out this one.
23. *Halcyon smyrnensis* (L.), White-breasted King-fisher.	14–6–18	In a hole in a bank.	5 eggs.	Yes, five young on 25-6-18.	4 young found on 26-6-18. 3 young found on 29-6-18. Took out these three.
24. *Rhipidura albifrontata* (Frankl.), White-browed Fantail Flycatcher.	28–5–18	10 ft. from ground on a Jamun tree.	3 eggs.	....	Destroyed by a storm on 3-6-18.
25. „ „ „ ..	24–6–18	8 ft. from ground on a Mango tree.	2 eggs.	No.	Nest destroyed on 1-7-18.
26. *Orthotomus sutorius* (Forst), Indian Tailor-bird.	30–6–18	1½ ft. from ground in a leaf.	4 eggs.	No.	3 eggs destroyed on 7-7-18. Nest deserted.
27. *Franklinia gracilis* (Frankl.), Franklin's Wren-Warbler.	5–7–18	„ „	3 eggs.	Yes, all three.	Nest empty on 21-7-18.
			77	39	26

DEHRA DHUN,
March 16th, 1922.

O. C. OLLENBACH, F.E.S.

No. VIII.—ON THE HOMING FLIGHT OF THE COMMON HOUSE-CROW (*CORVUS SPLENDENS*).

A friend of mine has recently furnished me with a most interesting account of an extraordinary flight of Common House-Crows (*Corvus splendens*) which he witnessed not long ago. As I have not had a similar experience, nor do I know of anyone else who has, I give below a brief description of what my friend saw. There are, possibly, some members of the Society who may have noticed a similar flight of crows, and if so, it would be interesting to know what explanations they have to offer as to the cause or causes of such flights. I understand that there is no record in our Journal, so that this note may be of some interest. Some who read this note will perhaps think that the facts are greatly exaggerated, but I am satisfied that there is very little, if any, exaggeration.

While undertaking a railway journey between Lahore and Ambala on the 14th January this year a large number of common house-crows was observed moving in the same direction as the train between the stations of Goraya and Phillaur. The most noticeable feature about this flight was the number of birds seen. My friend states that the crows were at least "ten deep" that they were *in a solid phalanx about three miles in length*, and that the number of crows he saw must have run into *tens of thousands*. The birds were all flying in one fixed direction, *viz.*, from North-West to South-East, and appeared to be coming in the direction of Phillaur from some point North-West of that station. The birds were close to the train and were flying parallel to it, sometimes very near to the carriages and sometimes a little distance away. The height at which the crows were flying was estimated at about 40 feet approximately, as they were above the tops of the trees (keekur and babool) growing in that part of the country through which the train was passing; the rate at which the crows were flying was estimated at 15 miles per hour; and the manner of their flight was a steady flapping. It is stated that some of the crows seemed to be slowing down and gave the impression that they had flown for a considerable distance. This idea was apparently a correct one, because along the whole route many trees were covered with evidently tired birds. The time at which this extraordinary flight of crows were seen was between five and six o'clock in the evening. The atmospheric conditions were: an overclouded sky, a low temperature sufficiently cold to make one close the windows of the railway carriage, and a cutting breeze from the North.

My friend is quite certain that the birds he saw were common house-crows (*C. splendens*), and further, that there were no other kinds of crows (*e. g. C. macrorhynchus*) or, in fact, any other species of birds which formed the enormous flock.

The above are the main facts concerning this curious flight. What were the causes which led to it? I cannot offer any explanation which I can say is correct. I am inclined to think that this flight was due to migration, which in turn was probably caused (?) either by (*a*) sudden change in climate in the place from which the crows were coming, or (*b*) lack of food-supply in that place. These seem to me to be *obvious* reasons which would explain why the flight was undertaken, but can there be any other causes, and if so, what are they? The facts that the crows were flying in such numbers, were all flying in one direction and in a fixed manner, were slowly slackening in speed, and were resting on trees *en route*, all point to migration. I do not think that it can be said that the crows were going to roost. Is the common house-crow a recognised migratory species in the sense that some ducks are? Is it even a locally migratory species? I should think that lack of food-supply would not have a strong influence in the distribution of so ubiquitous and omnivorous a species. Again, is it possible for the climate in a particular area in which crows are found to suddenly change in such a manner as to drive out the *crows* from that place?

Suppose we reject the migratory theory: what other theory could be advanced in support of this flight of crows in such large numbers? If we must retain the migration theory, then can it be said that crows are a non-migratory species?

DELHI, 22*nd February* 1922. S. BASIL-EDWARDES.

We submitted the above Note to Mr. H. Whistler who writes as follows :—

"I have read with care the note on a flight of crows which you have been kind enough to send me for perusal. In my opinion the writer's friend saw the flight as described by him, and the species was correctly identified. The flight was undoubtedly only the usual evening flight of *Corvus splendens* to its roosting place, which is a very familiar sight in portions of the Punjab. I am unaware whether similar flights occur in other parts of India, but in the Punjab they are noticeable in certain areas, where a suitable roosting place collects the birds for miles, around. These flights occur both in summer and winter, and the loitering about on the route (the "tired birds" of the writer), is a characteristic of the flights. There is no question of migration and no question of food supply involved: had the writer passed the same way on other evenings he would have seen similar flights."

A reference to similar flights is to be found in the Ibis, 1916, p. 42.—EDS.

No. IX.—THE WHITE-THROATED GROUND THRUSH (*GEOCICHLA CYANONOTUS*) AS A MIMIC.

On the 28th January 1921 it was my fate to be abroad at 3-30 a.m. As I was returning to the bungalow at dawn, I observed a White-throated Ground Thrush (*Geocichla cyanonotus*) perched on one of the lower branches of a leafless rubber tree, beside the road. It was singing, and one so seldom hears its pretty song that I stopped to listen. I could hardly credit the evidence of my own senses, for out of that ground thrush's open mouth poured forth the clear rollicking whistle of a spotted babbler, followed by a Nilgiri babbler's song, then came a much poorer attempt at a racket tailed drongo's bell-notes and finally its own tune was resumed.

A. P. KINLOCH, F. Z. S.

NELLIAMPATHY HILLS,

1*st February* 1922.

No. X.—THE OCCURRENCE OF THE BLUE-BEARDED BEE-EATER (*NYCTIORNIS ATHERTONI*) IN THE C. P.

In the Fauna of British India this species is stated not to have been reported either from Central India or the Central Provinces.

In a list of the birds of Pachmarhi recently published in Vol. XXVIII, No. 2 of the Society's journal I stated that I had heard on one occasion in the vicinity of Pachmarhi the characteristic guttural call of this bird, but that I had failed to see the bird. Such evidence was, to say the least, unsatisfactory.

I am glad to be able to report that I have quite recently watched a pair of these birds at close quarters at Nimbu Bojh within a mile of Pachmarhi, so that the occurrence of this bird in the Satpura hills is now an observed fact.

B. B. OSMASTON, I.F.S.

PACHMARHI, C. P.,

16*th January* 1922.

No. XI.—NOTE ON NIGHTJARS IN THE CENTRAL PROVINCES.

With reference to Mr. B. B. Osmaston's notes on Indian Nightjars I am able to supply the following authentic instances of Nightjars in the Central Provinces. The specimens themselves are all available for examination in the Nagpur Museum:—

FRANKLIN'S NIGHTJAR (*C. monticola.*)

No.	Sex.	Locality.	Date.
767	♀	Mouth of Tawa R. near Hoshangabad	25–1–1918
807	♀	Gothangaon, Bhandara District ..	3–5–1920
27	♂	Nagpur	16–3–1911
74	♀	,, ...	16–5–1911
626	♂	,, ...	15–6–1914
402	♀	,, ...	22–8–1912
516	♂	,, ...	29–8–1913
783	♂	Nagbhir, Chanda District	13–12–1918

COMMON INDIAN NIGHTJAR (C. *asiaticus.*)

307		Sawargaon, Chanda District	17–3–1912
781	♀	Nagbhir, Chanda District	12–12–1918
753	♀	Kampa, Chanda District	16–12–1917
756	♀	,, ,, ,, ...	18–12–1917
757	♀	,, ,, ,, ...	19–12–1917

HORSFIELD'S NIGHTJAR (*C. macrurus.*)

259	♀	Sumnapur, Baihar Tahsil, Balaghat District.	16–1–1912

We have a clutch of *C. asiaticus* from Saugor and there is a clutch from the Bilaspur District sent in as belonging to the Jungle Nightjar by Mr. Dunbar Brander.

Clutches of *C. monticola* have been taken by Mr. D. MacArthur in the Nagpur and adjacent Districts.

C. monticola, which is the common species at Nagpur, has a peculiar call resembling " wakh, wakh,—wakh wakhoo". Whether this call is uttered in the breeding-season only I am not quite sure.

E. A. D'ABREU.

CENTRAL MUSEUM, NAGPUR.

23rd January 1922.

No. XII.—THE FOOD OF THE SHIKRA (*ASTUR BADIUS*).

On the morning of 6th February a Shikra caught a little Indian Kingfisher under a babul tree 4 or 5 yards from me. The kingfisher gave the shikra a useful peck but the latter was just attacking the former's throat when I ran up and the shikra let go. The kingfisher flew off apparently unharmed. Somehow one does not connect a kingfisher with the idea of game for a small hawk. I felt rather virtuous at having saved the kingfisher from its cruel enemy but I smiled afterwards at my hypocrisy as I was on my way to my stand for a duck shoot.

I see the *Field* has been giving instances of a variety bag with one shot. I got a quail and a field rat on the 3rd with one shot which seems unusual.

E. O'BRIEN, Lt.-Col.

Bhuj, Cutch,
8th February 1922.

[The usual food of the shikra appears to be lizards, but it is not averse to seizing small birds, rats or mice, or even large insects.—Eds.]

No. XIII.—THE MARBLED DUCK (*MARMARONETTA ANGUSTIROSTRIS*) IN THE PUNJAB.

From what is said in Stuart Baker's Game Birds of India, Burma and Ceylon (Vol. I, page 242) regarding the distribution of the Marbled Duck I gather that records of its appearance in the Punjab may be of interest.

I have shot single specimens of this bird in the Punjab on four occasions :—

15th November 1908 28th February 1909	Ferozepore District.
20th November 1918 1st November 1921	Jhelum District (on the salt lake at Kallar Kahar in the Salt Range, altitude 2,100 feet.)

H. W. WAITE,
Indian Police.

Jhelum, Punjab,
24th March 1922.

No. XIV.—THE OCCURRENCE, HABITS AND BREEDING OF THE SPOTTED SANDGROUSE (*PTEROCLURUS SENEGALLUS*) IN THE BAHAWALPUR STATE, PUNJAB.

The spotted Sandgrouse (*Pterocluras senegallus*, Blanford) is, within my experience at any rate, sufficiently uncommon in the Punjab to justify my writing to you to record the fact that Col. O'Brien and I have recently shot it in this State.

On one occasion these sandgrouse (the only kind of sandgrouse about) were from 200 to 300 in number. The weather here has been rather unusual (cool and rainy) which perhaps brings these birds.

After writing the above I have had further opportunities of observing these birds and I am now able to give a definite assurance that this species breeds here also.

On the 7th current I was driving in a car through the desert at a place about 10 miles West of Ahmadpur East with a companion when I noticed a bird on the ground that seemed worth investigation. It was late in the afternoon, but we got out and looked. The bird proved to be a Sandgrouse, and, on approaching nearer, we saw that there were two. Then a second pair came in view and, by the time I looked at the first pair again, I found there were with them a pair of young ones about one-third their size, but well able to move on the ground. This was distinctly interesting, both because the date struck us as early for any Sandgrouse to be breeding and because we had both heard a note which assured us that this was *senegallus*, and were near enough to identify the colouring. We have both shot the spotted Sandgrouse recently and his note cannot be confused with that of the black-bellied *Pterocles arenarius* or the common *Pteroclurus exustus*.

The old birds with their young ran on ahead of us, and the tactics of the old ones were perfect. There was only one tiny bit of cover in the near neighbourhood in this waste of hard wind-swept clay, *viz.*, a thin strip of dwarfish bush not more than a few inches high. In this the parents left their babies, while they themselves ran on ahead and went through the most approved decoy antics. We were not deceived however and proceeded to hunt for the nestlings, which were soon found squatting very close with heads drawn in and looking exactly like the bits of dry camel dung which are to be found about. My friend stalked one little bird and caught it successfully in his hand, the infant not moving till it was secured. The other, either alarmed at the fate of its companion or because more advanced (there was a distinct difference in size between the two), got up as I approached and ran off, flapping its immature wings, but I secured it. There seemed a very good chance of our being able to bring the chicks up, so we determined to take them back with us. This we did, the old birds flying round us most persistently till the last.

These nestlings were densely covered with yellowish down of a most completely protective colour. My photo shows the two side by side on a brick of regulation size.

The day but one after, I went out and spent an hour and a half quartering the ground in the neighbourhood with a rope. I saw a flock of 14 of the same

species, but got no nests or eggs. Numerous smooth hollows in the ground hereabouts however were filled with convoluted droppings which I suspect to be those of this species. Their number seems to suggest that the birds may sleep, as the Common European Partrige is said to do, in parties heads outwards, tails inwards, for purposes of protection, but it is a point which I have not verified by personal observation. The nestlings were alive on the 10th April, and the man in charge of them, who has much to do with the care of domestic fowls, reported that they were doing satisfactorily, though he had to feed them by hand still. I then had to go away for several days and was distressed to find on my return that both had died. The precocity of the Sandgrouse and their congeners among "nidifugous" birds is well-known. I should imagine that these youngsters were a week to ten days out of the egg when we found them.

The place where our find was made is not less than 30 miles from the River Indus, which with the *jheels* and ponds near it, is where our winter species drink. This bears out what Stuart Baker has to say about the distance these birds breed away from water. How then are the young birds given the liquid they require? A recent book of a type more scientific than it affects to be, *viz.*, Pycraft's "History of Birds," says that the parent Sandgrouse, after slaking their own thirst at distant water, wallow till their under-plumage is laden with water, which they are able to convey, after the long return flight, to their young. Regurgitation, as with other kinds of birds, is perhaps a means of providing liquid or food of a semi-liquid kind.

A last point for notice is that the chicks were able to give the call-note of the species,—which may be rendered "*whit-hu*", perfectly. It is not difficult for a human to mimic, and I could get the youngsters to answer me when I tried it on them. Stuart Baker gives the Sindi name as *Gutu*, which is no doubt onomatopoeic like the Vernacular names for the commoner kinds of Sandgrouse that I am familiar with in the Punjab.

DERA NAWAB N. W. R., R. C. BOLSTER.
BAHAWALPUR STATE,
19*th April* 1922.

No. XV.—CROCODILE SHOOTING AND SNARING.

(*With a plate.*)

Mr. Shortt's good article was enjoyable reading.

My own shooting has been confined entirely to Sind, and to crocodile in jheels, "dunds" we call them here. A year ago I spent a week at a group of "dunds" in the neighbourhood, they were full of mugger, but the beasts difficult to shoot as the shores in most places were open maidan, with no cover excepting where too thick to penetrate. All the shooting had to be done on the same side, as the crocodile stalked was lying, as the water was too wide to fire across. As a result of some years' experience at this sort of shikar, I have formed certain theories, and my methods of stalking are based on these.

The occasion here related was the first shoot of sufficient length I had had, to give my methods a really good test.

I may first of all say that I have never been successful in approaching mugger over open ground unless the wind was in my favour, excepting for odd animals sound asleep. I have frequently noticed that sheep, goats and cattle, however much noise they made when feeding naturally, and not galloping about in fright, never sent mugger into the water. I found that by getting on to my hands and knees at a long distance from the mugger, and appoaching

in a more or less irregular and zig-zag fashion avoiding a straight line, and pausing at intervals in the manner of a feeding animal, I could get easily within 40 or 50 yards.

Previously I always used a H. V. magazine rifle, and relied more on the force of the blow at a longer range. When I discovered that by adopting the tactics described I could get up to a much nearer range I experimented with a lighter weapon, much easier to handle and with no recoil and little noise, and which I could use much more accurately. I found, that provided the right spots, as described in Mr. Shortt's article were reached, the result, H. V. or Low Velocity, was much the same. The mugger was either killed or more frequently knocked out sufficiently to allow him to be secured. In addition to the advantages the light rifle mentioned gives, one gets infinitely more chances of shots, and provided the securing and despatching is done with little noise it is very common to find another candidate waiting round the next bend of the shore. During the first day's shooting I secured 14 skins and actually had 5 lying on the shore in different parts of a large " dund " awaiting the skinners, who were very much overworked that day ! ! I got 42 skins in the week, average 8 ft.

I take with me four men, two of them are Bhils, for skinning. These two follow me, keeping out of sight all the time in the jungle, until called up by a whistle The chief assistant follows me, stalking as I do, and at a few yards distance behind me. The second keeps well behind. If the stalk is successful everything is done as quietly as possible, without shouting, or loud expressions of satisfaction, and when the dead mugger is drawn up the beach to be skinned out of sight, I am ready to continue. I have often been amused at the gathering accompanying some sportsmen I have seen at work. There is nothing a mugger hates worse than a durbar, and no wonder that many people find they are hard to get under such circumstances.

Curiously enough I have never seen mugger come up again after being wounded, excepting for one that I hit and for some reason he could not submerge.

I have known them come out to die often enough, and one I remember came out half an hour afterwards, right to my feet. In the dunds I speak of they are all of the blunt nosed variety (*C. palustris*), rarely over 12 feet, though in a certain " dund " I know of, entirely surrounded by high sand hills, there are 5 or 6 big Gavials (*G. gangeticus*), all about the same size, 14 feet, judging by one I got.

I have heard it said that Gavials cannot climb over these hills and go from dund to dund the way the other kind do. If this is so, it is interesting to speculate how they got there, or if they were imprisoned by the sand hills forming, as they do very quickly about here.

I have been unable to find any reliable information regarding the age of crocodiles, and as they grow so differently under different conditions I think it must be impossible to tell.

Once when fishing, I hooked and played and eventually landed a small Gavial, 2 ft. in length. He gave excellent sport, and just as I got him to the bank exhausted, a large turtle came up and bit off a forefoot. I kept him alive in a tank for some months. I have thrice hooked big fellows while fishing, but they have simply lain like logs and worried the cast through. A friend shot one, in the act of swallowing a wild cat, which was quite fresh and had presumably been seized while drinking.

There are two methods known to me which are practised in Sind, by which mugger are taken alive. The first which I have not actually witnessed myself is as follows.

The water must be shallow enough to allow men to wade, say up to their necks. A man goes out on a hollow copper pot, the usual way of crossing water

Tying a rope round the mugger's neck after the hand net is in position.

Pulling the reptile out of the water.

CROCODILE SNARING IN SIND.

about here. He locates a mugger lying in the mud at the bottom, and places the stick he carries on the animal's back, which remains motionless, for some reason or other. Other men then come into the water, and duck under and get a rope round him, and he is then pulled out.

The other method I have seen. When the river water recedes the dunds are partially drained through narrow channels. Mugger wandering at night take refuge in the deeper spots in these channels and are tracked there. The first step is to burn away all overhanging grass and bushes, as the brute is invariably lying in a hole under the bank, head outwards, and under water of course. His head is located by a stick and a small hand net is placed over his head. I have never quite understood the reason of this, as it would be of no use to hold him or to protect the men. I believe that when a crocodile feels any pressure on his body or head he is disinclined to move, possibly through fright.

Another man then gets into the water and with the head actually touching him, and facing him, ties a rope round the mugger's neck, or forelegs.

Until pulled to the surface he makes no movement of any kind, and the whole proceeding is the tamest and most unexciting affair imaginable.

A wounded mugger is another proposition and feared by the men who do this work.

Regarding the treatment of skins, I have found that they will keep indefinitely it put into a pit in the ground after being well cleaned and kept in brine.

Though the Railway do not accept wet skins it is possible to pack them while wet into a packing case and send them in this way.

I attach two photographs showing the second method of catching crocodile alive, and it will be noticed that the lower jaw of the animal depicted has been shot away partially at some time. We also found a number of hard lumps in which we expected to find bullets, but they only contained hard black sand or something similar.

"SIND."

2nd February 1922.

No. XVI.—FOOD OF THE FAT-TAILED LIZARD (*EUBLEPHARIS MACULARIUS*).

As very little is known of the food of Indian Lizards it may be of interest to record that the Fat-tailed Lizards (*E. macularius*) living in captivity in the Society's rooms feed very readily on any Lizards introduced into their cage; a young skink (*Mabuia carinata*) and a common blood sucker (*Calotes versicolor*) were both very easily accounted for. On one occasion an immature Fat-tailed Lizard (*E. macularius*) met with a similar fate.

The two lizards have lived in the Society's rooms for the past 5 years. They were presented by Capt. W. B. Cotton from Wano Waziristan, and until quite recently they lived almost exclusively on Spiders and Insects, chiefly grasshoppers and cockroaches, and could even be tempted into eating the crumbs of a biscuit. Their vision by day strikes one as being rather defective as it is constantly noticed that they make several aimless snaps at food which is literally under their noses; this was strikingly displayed in the case of a skink who, hemmed in a corner by one of these lizards, repeatedly wriggled into safety owing to the blundering tactics of its pursuer. These lizards betray an extreme ferocity in attack, one of them sprung from the ground on to a branch about 8 inches overhead in an attempt to secure its victim. Since writing the above the writer introduced a scorpion into the cage occupied by the lizards. It was immediately seized and swallowed, repeatedly stinging

its attacker about the head and lips during the process. The lizard paid not the slightest heed to these demonstrations on the part of its victim, but swallowed it in a few gulps and seemed none the worse for the experience.

BOMBAY NATURAL HISTORY SOCIETY, S. H. PRATER, C.M.Z.S.

16*th May* 1922

No. XVII.—THE SENSES OF A SNAKE.

The sight of snakes is not good in the day time even in the case of diurnal snakes with round pupilled eyes. Those snakes that stalk their prey instead of waylaying it, do so chiefly by means of the tongue. The two branches of the forked tongue, flickering up and down, come in contact with the two footprints of the animal or reptile stalked and then dart up to its own nose, each branch conveying to one of the nostrils the scent of its prey.

If a snake is watched stalking prey which it cannot see, in long grass for instance, it will be noticed that it follows the exact course, no matter how twisted, of the creature it is after, which proves that until the prey is sighted the snake depends on scent and not on hearing.

It is uncertain whether the tongue of a snake is able to sense a scent spoor itself, or whether it is entirely dependent on the nostrils of the snake to do this: at any rate the tongue appears to act as the carrier of the scent to the nostrils.

If the tongue itself could sense a scent spoor, it would no doubt receive it in the form of taste. It is, however, doubtful whether a snake possesses much, if any, sense of taste. Several instances have been reported, and I have seen a few cases myself, where snakes in captivity have seized and swallowed cloths, and, in one case even a stick, which had previously come in contact with, and absorbed the scent of rats, which the snakes, relying chiefly on their sense of scent, mistook them for. It must, however, be admitted that in all such cases I have heard of, the snakes in question have been Pythons, which, being nocturnal snakes, with eyes adapted for night work (*i.e.*, elliptic-pupilled), see badly in the day-light.

One of the most notable examples of such an accident, was the case of a Python at the London Zoological Gardens which seized and swallowed a rug. I do not know whether the snake was misled by feeling or by scent in this case, but it helps to show that snakes possess little or no sense of taste.

A snake's tongue appears to act as a guide as well as a scent carrier, playing the same part as whiskers do in a cat. As, however, a snake is not totally blind and only bad sighted, it is curious that it uses its tongue as much as it does, when not hunting.

Possessing no external ears, even in the form of ear-holes, the hearing of snakes is bad. Sounds appear to be conveyed to it chiefly through vibrations through the ground, and it is easily disturbed by footfalls, while often remaining deaf to louder noises above ground level, and I have found that it is possible to approach closer to a snake without alarming it, when walking on a ground level above it, as for example walking on the bund of a paddyfield when the snake is lying below the bund.

A. F. ABERCROMBY.

TRAVANCORE.

12*th July* 1921.

No. XVIII.—PEARL BEARING MUSSELS.

Mr. Laird Macgregor recently forwarded the Society a small packet of Pearls produced by a species of Mussel found in a tank at Badas a few miles from Belgaum. Two examples of the Mussel were sent with the packet. Mr. Laird Macgregor wrote :—" I do not suppose the pearls are of any value, but is it not rather unusual to find pearl bearing mussels in fresh water? "

The mussels and pearls were sent to Mr. Hornell, Director of Fisheries, Madras, for investigation and Mr. Hornell has sent in the following interesting remarks in connection with them.

" The shells are of the common fresh-water mussel, probably *Lamellidens marginalis.* This species is often very abundant in fresh waterponds and streams and it is not uncommon for it to produce pearls. The quality is usually poor on account of the small size, poor lustre and frequent colouration. But when the mussels occur in large numbers and when they produce pearls freely, their collection is remunerative ; such small pearls should fetch about Rs. 10 per tola weight and there is always the chance of finding a large pearl of fair lustre that may command a price of anything up to Rs. 50 or possibly even more. At Surada in Ganjam, fresh water Mussels producing pearls are so abundant that the villagers collect them for this purpose and their pearls are often to be had in the village bazaars. Similarly in Bengal there is a well-known Zemindari fishery for these Mussels farmed out, I believe, by the Zamindar for a considerable sum.

Curiously enough these Mussels vary greatly in their pearl-producing quality. In some localities, pearls are so seldom formed that collection of the Mussels is wholly unremunerative. This is due to the fact that the formation of pearls in these animals is due mainly to the presence of certain parasites. If these be absent, as in most localities, the Mussels produce few or no pearls ; if they be numerous, we may then expect pearl production to be abundant.

The famous Scots pearls celebrated in the middle ages are produced by river-mussels closely related to those sent to me. As is well known these pearls are occasionally of considerable value. But they are distinguished by a pink tint which diminishes their market value. Those sent from Belgaum are similarly tinted. Several of these fresh-water pearl fisheries are still worked in the north of Scotland. Some Welsh streams also produce pearl-bearing Mussels.

In North American rivers, the fishery for fresh-water mussels is a big industry employing hundreds of workers and a large capital. But while pearls are occasionally found of some considerable value, this fishery is conducted primarily to obtain mother-of-pearl for the pearl button factories. These consume many tons of these fresh-water Mussel shells.

In India, this same industry has arisen in Bengal, where supplies of a species of *Lamellidens* are found in the rivers, sufficiently stout to permit of poor quality shirt-buttons being cut from the shell. I believe it might be worth while to examine the streams and large tanks throughout the Bombay Presidency in order to ascertain if any species exists here with shell sufficiently thick and in good abundance, for if there be, then further quantities might be cultivated and the material sold for button making.

Streams draining from or passing through a limestone region are the most likely to produce thick-shelled Mussels. Here in Madras, the streams are generally deficient in carbonate of lime and so our Mussels are almost wholly too thin shelled to be utilizable commercially."

No. XIX.—AN UNUSUAL SWARM OF MOTHS.

The Society recently received a number of moths which were said to be swarming in very large numbers round the cantonments at Amballa. Lt.-Col. J. Patterson in forwarding the specimens wrote:—

"Numbers are found every morning in dark corners, such as behind pictures, inside topees, behind almirahs, curtains, etc. They get into strange places such as chests of drawers, the only way to which is by entering at the bottom of the chests of drawers, and passing up between the back of the drawers and the back of the piece of furniture. I do not think they can breed out in the drawers.

I have asked the inhabitants here and they say that they have never seen anything like these numbers of moths."

The moths were examined by Mr. T. R. Bell who identified them as follows:—The moth is *Agrates flammatra*, Fabricus; in England it is called the Black-collar and is very rare. It is there known as *Noctua flammatra*; I believe its new generic name is *Rhycia*. I do not know anything about the local food plant but it is probable that it feeds upon any low plant. The food plant in Europe is the Dandelion, *Taraxacum densleonis* and Strawberry (*Fragaria*). The larva is certain to pupate underground in the earth like others of the type. In some years it is certain to find that certain species of moths turn up in enormous numbers even though, ordinarily, they may be scarce. It depends mostly, I think, on absence of Natural enemies (Ichneumons, etc.) combined with suitable climatic conditions.

No. XX.—OCCURRENCE OF THE GALEOD SPIDER (*RHAGODES NIGROCINTUS*) IN THE SOUTH ARCOT DISTRICT, MADRAS PRESIDENCY.

(*With a photograph.*)

It may be of interest to your readers that a male specimen of *Rhagodes nigrocintus* (*Galeodidæ*, Arachnida) was obtained last September at Gingee in the South Arcot District of this Presidency.

The interest of the specimen lies in the fact, I believe, that it is the second specimen of the species on record and the first male specimen. The female specimen through which the species is known is recorded from Vellore and is in the British Museum (*vide* J. B. N. H. S., Vol. IX, p. 452). The present specimen is in the Indian Museum.

I may state that I am confirmed in my identification by Dr. Gravely of the Madras Museum.

DEPARTMENT OF ZOOLOGY,
MADRAS CHRISTIAN COLLEGE,
29th July 1921.

S. G. MANAVALARAMANUJAM.

No. XXI.—A CASE OF PLANT SURGERY.

There is an old gigantic Baobab tree (*Adansonia digitata*) probably more than 300 years old, since the offenders sentenced to death at the time of Alli Adilshah, were executed on this tree (Bijapur Gazetteer,); for which reason the tree is still known as "The Execution Tree".

The tree has a very thick stem with a girth of 49 ft. at 3 ft., 50 ft. at 6 ft., and 58 ft. at 10 ft. from the ground. The largest measurement of *Adansonia digitata*, as stated by W. B. Bannerman from Madras in 1904, is 48'–2".* The tree divides into 3 huge branches at about 10 ft. from the ground. The whole tree covers an area of 10 gunthas. Thus it presents a huge appearance in the compound and attracts the notice of every passer-by.

Being old, this tree was naturally attacked badly by rot and the main trunk near the base, where there was a hole, and the whole of the heart of tree had disappeared.

Being afraid of losing the tree, Mr. Elliot, the District Judge, first applied to the Private Secretary to His Excellency the Governor of Bombay for steps to be taken to rejuvenate the tree. The correspondence was forwarded by the Director of Agriculture, Bombay Presidency, Poona, to the Economic Botanist to the Government of Bombay, Poona, and I was deputed for the work.

Being encouraged by the successful results of similar work done on Casuarina and other trees in the Ganeshkind Botanical Gardens, Kirkee, I went there and observed the tree. In the base, a hollow was found of the dimensions of 15 feet by 17 ft. It was conical in shape. The following operations were made during the first week of September 1920. The hollow was filled in with rubble and mud and concreted over. The affected parts were first cut out and it was found that the rot was due to the grubs of a large beetle. Hundreds of these grubs were cut out of the tree. As soon as the wound edges were cut down to sound wood, the wound was tarred over and then filled in with concrete. All other parts which showed signs of attack or susceptibility to it, within a short time were tarred over and any spot where water was likely to lodge was filled in with concrete.

The District Judge was pleased to remark in his letter, dated the 10th February 1921, addressed to the writer as follows:—

"The result has been a most workman-like job and the tree this year, though a famine year, at once reacted by producing a far finer foliage than was noticeable the year before. The whole job has been satisfactorily done and attracted a large crowd who had never seen such a surgical operation on a tree before."

* Journal, Bombay Natural History Society, Vol. XV, p. 718.

Within my knowledge this kind of operation has proved successful on the following trees in the Deccan :

Names :—

(1) *Garruga pinnata.*
(2) *Casaurina equistifolia.*

I recommend this treatment with confidence to the attention of those who have an interest in saving their old mango and other trees.

POONA,
January 1922.

L. B. KULKARNI, M.A.,
Assistant Professor of Botany.

PROCEEDINGS

OF THE ANNUAL MEETING HELD ON THE 27TH FEBRUARY AT THE PRINCE OF WALES MUSEUM.

The election of the following 7 members since the last meeting was announced :—Capt. C. P. Hancock, Bombay ; Capt. J. L. Longbottom, Bombay ; Rev. J. C. Hall, Ahmednagar : Mr. W. W. Clifford, Nadiad : Mr. G. C. Phillips, Bombay : Mr. P. G. Glendinning, Moulmein ; and Mr. R. M. Crofton, I.C.S., Amraoti.

COMMITTEE OF MANAGEMENT.

The following gentlemen were elected as Office Bearers for the present year :—

PRESIDENT.

H..E. Sir George Lloyd, D.S.O., G.C.I.E.

VICE-PRESIDENT.

Mr. J. D. Inverarity, B.A., LL.B.
The Hon'ble Sir Norman Macleod, Kt.
H. H. The Maharao of Cutch, G.C.S.I., G.C.I.E.

MANAGING COMMITTEE.

Mr. T. Bainbrigge Fletcher, F.E.S., Mr. T. R. Bell, C.I.E., I.F.S. (Retd.)
Major R. Benson, D.S.O., Rev. E. Blatter, S.J., MR. B. C. Ellison, C.M.Z.S.
Lt.-Col. W. H. Evans, R.E., Major F. C. Fraser, I.M.S., Mr. A. E. Hefford.
Mr. J. E. B. Hotson, I.C.S., Prof. V. N. Hate, M.A., Mr. C. M. Inglis, F.Z.S., M.B.O.U.
Lt.-Col W. Glen Liston, C.I.E., I.M.S., Mr. F. Ludlow, I.E.S., M.B.O.U.
Mr. P. J. Mead, C.I.E , I.C.S , Mr. H. P. Macnaghten, M.A., M.L.C., MR J. C. Ridland.
Mr. P. M. D. Sanderson, Major C. H. Stockley, D.S.O., DR. D. A. Turkhud.
Mr. H. Whistler, F.Z.S., M.B.O.U., C.F.A.O.U.
Mr. R. A. Spence, the Honorary Secretary and Mr. H. F. Lodge, Honorary Treasurer being *ex-officio* members of the Committee.

SOCIETY'S REPRESENTATIVES IN ENGLAND.

W. S. Millard, Esq., F.Z.S., and E. C. Stuart Baker, Esq., M.B.O.U., C.F.A.O.U., F.Z.S.

ALTERATION IN RULES.

In accordance with the notice on the agenda Mr. R. A. Spence, the Honorary Secretary, moved that the following new rule be adopted and inserted between rules 2 and 3 :—

2 (*a*)

The Society shall consist of Life Members and Ordinary Members. The Committee are authorised to invite such persons as they may think fit to be Patron or Vice-Patrons of the Society.

THE HONORARY SECRETARY'S REPORT FOR THE YEAR 1921.

With regard to the working of the Society during the past year the following may be of interest to members :—

MEMBERSHIP.

At the end of the year 1920 there were 102 Life Members on the roll of the Society and 1,744 Ordinary Members had paid their subscription for 1920. In 1921 financial stress compelled an increase in the annual subscription and in the entrance fee with a corresponding rise in the Life Membership donation. Old members were however allowed six months in which to become Life Members at the old rate and this privilege was availed of by no less than 49 members.

At the end of 1921 there were 151 Life Members on the books and 1,165 who had paid their subscription for 1921.

PRINCE OF WALES MUSEUM.

The past year has marked an important epoch in the history of the Society, namely the commencement of the Society's activities in its new role of maintaining and providing a Museum for the benefit not merely of its members but for the benefit of the public of Bombay. The scheme for the arrangement of the Society's display collections in the Prince of Wales Museum was prepared by Messrs. Ellison and Prater in March 1921 and at the time of His Royal Highness' arrival in India the Curators had arranged for his inspection and for that of the general public a very interesting display of the Fauna of the Indian Empire. Unfortunately the exhibit has had to be temporarily closed to the public until the necessary glass show cases have been obtained as without the protection afforded by air-tight cases the specimens would be attacked by living Natural History Specimens of a type better dead than alive.

Estimates have been prepared of the cost of show cases and also separate estimates of the cost of mounting specimens. The grant of Rs. 40,000 already made by the Bombay Government is about a lakh of rupees short of the amount required to carry out the Curators' Scheme in its entirety. It is evident from this that if the Public of Western India are to have a Museum worthy of the Prince of Wales and "Urbs Prima in Indis" a very generous response will have to be made to the appeal the Society is making for the provision of the necessary funds.

MAMMAL SURVEY.

The Mammal Survey has been continued during the past year and will be carried on throughout this year mainly in consequence of financial assistance received from the Central Government. This assistance has been given because of the value the Survey is to the Country and because the Society had provided in the past over a lakh of rupees for the carrying on of the Survey and it is in the interests of Government to help those who help Government to save money.

H. R. H. THE PRINCE OF WALES AND THE SOCIETY.

The past year will also be memorable on account of the connection of the Society with the visit of H. R. H. The Prince of Wales to India. It was with great pleasure that the Committee received intimation that their offer of the services of their Curator, Mr. Ellison, and some of the staff to supervise the skinning and mounting of trophies obtained by H. R. H. and the party in India had been accepted. It is with greater pleasure

that the Committee record that the services Mr. Ellison and his party have been able to render have been appreciated and that H. R. H. has intimated his willingness to become a Life Member of this Society. It is hoped that the connection of H. R. H. with the Society may become even more closely marked.

APPRECIATION OF WORK OF THE STAFF.

The Committee take this opportunity of expressing their appreciation of the work done by the members of the Staff. The absence of the Honorary Secretary during part of the year and Mr. Ellison's deputation on the Prince's tour has thrown a good deal of work on to the shoulders of Mr. Prater. This extra burden he has cheerfully accepted and borne to the full satisfaction of all connected with the Society.

CONTRIBUTIONS TO THE MUSEUM.

Mammals.

1 Indian Elephant Skeleton (*E. maximus*), Kanara, M. S. Tuggerse.
1 Golden Cat (*F. temminckii*), Moulmein from Togon Valley, Tenasserim, G. Hundley.
1 Tenasserim Giant Squirrel (*R. melanopepla*), Moulmein from Togon Valley, Tenasserim, G. Hundley.
2 Taylor's Flying Squirrels (*P. taylori*), Moulmein from Togon Valley, Tenasserim, G. Hundley.
1 Leopard Cat (*F. bengalensis*), Moulmein from Togon Valley, Tenasserim, G. Hundley.
2 Skulls of Brow-Antlered Deer (*C. eldi*), Punjab, Major C. H. Stockley.
2 Skulls of Indian Gazelle (*G. bennetti*), Punjab, Major C. H. Stockley.
4 Skulls of Bears (*Ursus* sp.), Punjab, Major C. H. Stockley.
1 Sind Ibex (*C. hircus blythi*), Punjab, Major C. H. Stockley.
1 Tiger cub skull (*F. tigris*), Amraoti, R. A. Wilson.
1 Common Indian Mongoose (*M. m. mungo*), Amballa, A. E. Jones.
1 Albino Spotted Deer (*A. axis*), Mahomed Kharim Khan.
1 Indian Lion (*Felis leo*), from the Maharaja Kumar Sahib of Kotah.
1 Black Bear (*U. himalayanus*) (Rug), Lt.-Col. H. D. Peilo.
1 Black Bear (*U. himalayanus*), (Head mounted on shield), Lt.-Col. H. D. Peilo.
1 Large Burmese Civet Cat (*Viverra* sp.), Eindayaza, Tenasserim, Salim A. Ali.
1 Burmese Leopard Cat (*P. pardicolor*), Eindayaza, Tenasserim, Salim A. Ali.
1 Striped Burmese Squirrel (*T. maccellandi*), Eindayaza, Tenasserim, Salim A. Ali.
1 Golden-backed Squirrel (*C. cuneiceps*), Eindayaza, Tenasserim, Salim A. Ali.
2 Taylor's Flying Squirrels (*P. taylori*), Eindayaza, Tenasserim, Salim A. Ali
1 Langur (*Pithecus entellus*), Yellapur, Kanara, G. Amor.
3 Bats, Turjum Tea Estate, Darjeeling, Oscar Lindgren.
1 Yunan Flying Squirrel (*P. yunanensis*), Sikhim, F. M. Bailey.
5 Bats, Rustum, Right Bank of Dyala River, Mesopotamia, J. Fernandes.
1 Painted Bat (*K. picta*), Mandalay, Burma, C. C. Ghooh.

Birds.

1 The Eastern Red-breasted Flycatcher (*Siphia albicilla*), Ghazipur, U. P., E. H. N. Gill.

1 Gull-billed Tern (*Sterna anglica*), Ghazipur, U. P., E. H. N. Gill.
1 Black Vulture (*Otogyps calvus*), Ghazipur, U. P., E. H. N. Gill.
1 Indian White-backed Vulture (*Pseudogyps bengalensis*), Ghazipur, U. P., E. H. N. Gill.
1 Spoon-bill (*Platalea leucorodia*), Jodhpur, Rajputana, Miss P. Hawksley.
2 Quails (*Microperdix* sp.), Manipur, Assam, Mr. Clarke.
2 Chinese Francolin (*F. chinensis*), Mr. Clarke.
1 Western Blue-rock Thrush (*M. S. pandoo*), Khandalla, A. Fitzgerald.
1 Malabar Wood Shrike (*T. pondicerianus*), B. E. C. Beadnell.
1 Peregrin Falcon (*F. peregrinus*), Bakloh, Punjab, Capt. Chas. Bilderbade.
2 Western Blossom-headed Paroquets (*P. cyanocephalus*), Yellapur, Kanara G. Amor.
1 Palm Swift (*T. batassiensis*), Salem, D. F. Stileman.
1 Indian Grebe (*P. albipennis*), Salem, D. F. Stileman.
1 Large Pied Wagtail (*M. madraspatensis*), Salem, D. F. Stileman.
1 Indian Tree pie (*D. rufa*), Salem, D. F. Stileman.
1 Indian Bee-eater (*M. viridis*), Salem, D. F. Stileman.
1 Common Indian Hawk Cuckoo (*H. varius*), Salem, D. F. Stileman.
1 Common Indian Roller (*C. indica*), Salem, D. F. Stileman.
1 Black Drongo (*D. ater*), Salem, D. F. Stileman.
A large collection of Birds, Bengal, C. M. Inglis.*
47 Birds, Munchar, Sind, Capt. C. E. Benson.
49 Birds, Yellapur, Kanara, Capt. C. E. Benson.
2 Birds, Burma, F. Kingdon Ward.
10 Birds, including 3 Tragopans (*T. temminckii*) and one Koklass pheasant (*P. macrolopha*), Nepal, B. C. Ellison.

Birds Eggs.

1 Bird's egg, Aurangabad, Deccan, Major C. C. Hicks.
4 Eggs (*P. torquatus*), Larkana, Sind, George Amore.
3 Eggs (*Gallus soneratti*), S. India, A. P. Kinloch.

Birds Nests.

1 Nest of Nilgiri Babbler (*Alcippe* sp.), Silver Cascade, S. India, Chas. McCann.
2 Nests of Nilgiri Babbler (*Niltava* sp.), Silver Cascade, S. India, Chas. McCann.

Reptiles.

Snakes.

1 Fasciolated Rat Snake (*Z. fasciolatus*), Thana, Bombay Presidency, Purchased.
1 Anamallay Viper (*L. anamallensis*), Silver Cascade, S. India, Chas. McCann.
1 Common Wolf Snake (*L. aulicus*),
2 Common Keelbacks (*T. stolatus*),
1 Green Keelback (*M. plumbicolor*),
1 Russell's Viper (*V. russelli*), } F. Poole.
1 Helen's Snake (*C. helena*), S. India, A. P. Kinloch.
3 Blind Snakes (*S. brevis*), S. India, A. P. Kinloch.
4 (*Ablabes calamaria*), Kangra District, Punjab, H. Whistler.
2 Common Keelbacks (*T. stolatus*), Kangra District, Punjab, H. Whistler.

* This is the largest collection presented to the Society since 1914. A list will be published in a further number of the Journal.

2 Himalayan Vipers (*A. himalayanus*), Kangra District, Punjab, H. Whistler.
2 Young Cobras (*N. tripudians*), Karachi, F. Wall.
1 (*U. grandis*), F. Wall.
1 (*D. pulverulentus*), Matugama, Ceylon, F. Wall.
1 Tree Snake (*Dipsas ceylonensis*), Matugama, Ceylon. F. Wall.
4 (*Acontia burtoni*), Matugama, Ceylon, F. Wall.
1 Common Sand Boa (*E. conicus*), Ahmedabad, F. Wall.
3 Saw-scaled Vipers (*E. carinata*), Karachi, A. Flynn.
1 Common Wolf Snake (*L. aulicus*), Igatpuri, District Surgeon.
1 Common Sand Boa (*E. conicus*), Igatpuri, District Surgeon.
1 (*Lioselasma spiralis* ♀), Henjam, P. Gulf, Capt. Mody.
1 (*Lioselasma cyanocinctus*), Henjam, P. Gulf, Capt. Mody.
6 Snakes, Nagrispur, Darjeeling, Oscar Lindgren.
1 Rat Snake (*Z. mucosus*), Yellapur, Kanara, G. Amore.
1 Common Green Whip Snake (*D. mycterizans*), Yellapur, Kanara, G. Amore
3 Large-scaled Vipers (*L. macrolepis*), Silver Cascade, S. I., Chas. McCann.
1 Common Checkered Snake (*T. tassellatus*), Nahrumar, Mesopotamia, Capt. R. N. Seval.

Lizards.

3 *Eumeces schneideri*,
3 *Eumeces scuttatus*,
2 *Eublepharis macularius*,
3 *Agama isolepis*,
1 *Agama rubrogularis*,
2 *Agama nupta*,
1 *Agama caucasica*,
1 *A. lirata*,
4 *Lygosoma* sp.,
} Capt. C. M. Ingoldby.
1 Gecko, Karachi, F. Wall, I.M.S.
3 *Draco* sp., Yellapur Kanara, G. Amore.
1 Gecko, Yellapur, Kanara, G. Amore.

Fish.

2 Fish, S. India, A. P. Kinloch.
1 *Octopus* sp., Mahim Beach, A. F. Ferguson.
1 Fish, Hassimara Duars, H. V. O'Donel.

Insects.

1 Glow Worm, Mysore, Van Ingen.
1 Giant Centipede, S. India, D. G. Cameron.
1 *Vespa cincta*, S. India, A. P. Kinloch.
1 Box of Dragonflies, Bangkok, Siam, E. W. Trotter.
6 Moths (*Agrotis flammatra*), Lt.-Col. J. Patterson.
Minor contributions from J. Fernandes, Mesopotamia, A. Fitzgerald, Khandala, E. M. Van Ingen, Mysore, Capt. S. Jervis.

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